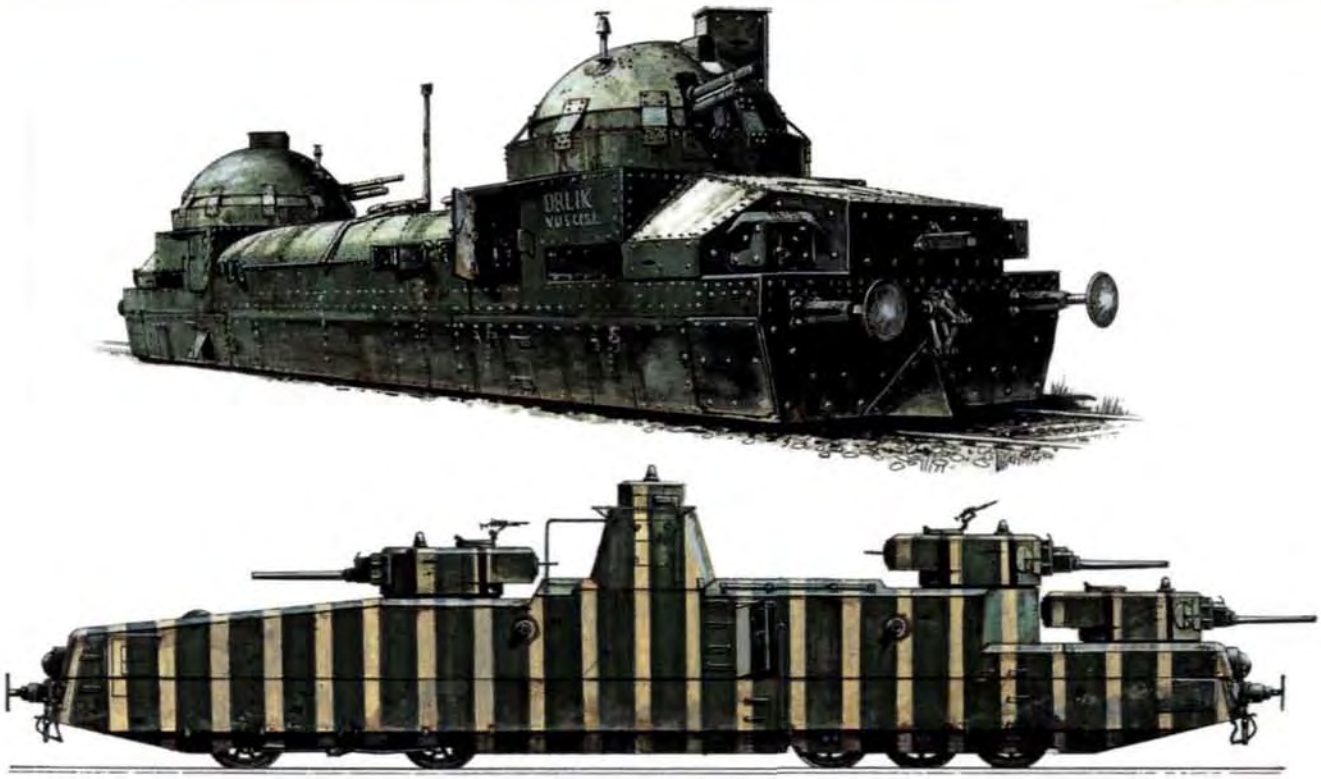
ARMORED TRAINS



STEVEN J ZALOGA

ILLUSTRATED BY TONY BRYAN

ABOUT THE AUTHOR AND ILLUSTRATOR

STEVEN J ZALOGA was born in 1952. He received his BA in History from Union College and his MA from Columbia University. He has published numerous books and articles dealing with modern military technology, especially armored vehicle development. His main area of interest is military affairs in the former Soviet Union and Eastern Europe in World War II, and he has also written extensively on American armored forces. Steven lives and works in Maryland.

TONY BRYAN is a freelance illustrator of many years' experience who lives and works in Dorset, UK. He initially qualified in Engineering and worked for a number of years in Military Research and Development, and has a keen interest in military hardware – armor, small arms, aircraft and ships. Tony has produced many illustrations for partworks, magazines and books, including a number of titles in the New Vanguard series.

NEW VANGUARD • 140

ARMORED TRAINS

STEVEN J ZALOGA ILLUSTRATED BY TONY BRYAN

First published in Great Britain in 2008 by Osprey Publishing,
Midland House, West Way, Botley, Oxford OX2 0PH, UK
443 Park Avenue South, New York, NY 10016, USA
E-mail: info@ospreypublishing.com

© 2008 Osprey Publishing Ltd.

All rights reserved. Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the Copyright, Designs and Patents Act, 1988, no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, electrical, chemical, mechanical, optical, photocopying, recording or otherwise, without the prior written permission of the copyright owner. Inquiries should be addressed to the Publishers.

A CIP catalog record for this book is available from the British Library

ISBN: 978 1 84603 242 4

Page layout by: Melissa Orrom Swan
Index by Alan Thatcher
Typeset in Sabon and Myriad Pro
Originated by PDQ Digital Media Solutions
Printed in China through Worldprint

08 09 10 11 12 10 9 8 7 6 5 4 3 2 1

FOR A CATALOG OF ALL BOOKS PUBLISHED BY OSPREY MILITARY AND AVIATION PLEASE CONTACT:

NORTH AMERICA
Osprey Direct, c/o Random House Distribution Center, 400 Hahn Road, Westminster, MD 21157
E-mail: info@ospreydirect.com

ALL OTHER REGIONS
Osprey Direct UK, P.O. Box 140 Wellingborough, Northants, NN8 2FA, UK
E-mail: info@ospreydirect.co.uk

Osprey Publishing is supporting the Woodland Trust, the UK's leading woodland conservation charity, by funding the dedication of trees.

www.ospreypublishing.com

AUTHOR'S NOTE

I am indebted to several friends who provided me with a substantial amount of information and a large number of photos over the years, especially Janusz Magnuski, Just Probst, Ivan Bajtos, James Loop, and Jim Cochran. Unless otherwise noted, all photographs are from the author's collection. Sadly, Janusz Magnuski, Ivan Bajtos, and Jim Loop died before their time, and this book is dedicated to their memory.

ARMORED TRAIN CAMOUFLAGE

Aside from standardized armored trains such as the Soviet, Polish, and German trains of World War II, there is little recorded information on the camouflage painting of armored trains. As a result, the schemes shown in the plates are somewhat speculative until further information emerges.

EDITOR'S NOTE

For ease of comparison between types, imperial measurements are used almost exclusively throughout this book. The exception is weapon calibers, which are given in their official designation, whether metric or imperial. The following data will help in converting the imperial measurements to metric:

1 mile = 1.6km
1lb = 0.45kg
1 yard = 0.9m
1ft = 0.3m
1in. = 2.54cm/25.4mm
1 gal = 4.5 liters
1 ton (US) = 0.9 tonnes
1hp = 0.745kW

CONTENTS

INTRODUCTION 4

ORIGINS 5

WORLD WAR I 10

THE RUSSIAN CIVIL WAR 13

WAR OF THE EMPIRES 20

ARMORED DRAGONS 21

WORLD WAR II 24

Blitzkrieg armored trains
Russian developments, 1922–41
Soviet armored trains, 1941–45
Wehrmacht armored trains, 1941–45
Other armored trains in World War II

THE DECLINE OF ARMORED TRAINS 44

FURTHER READING 45

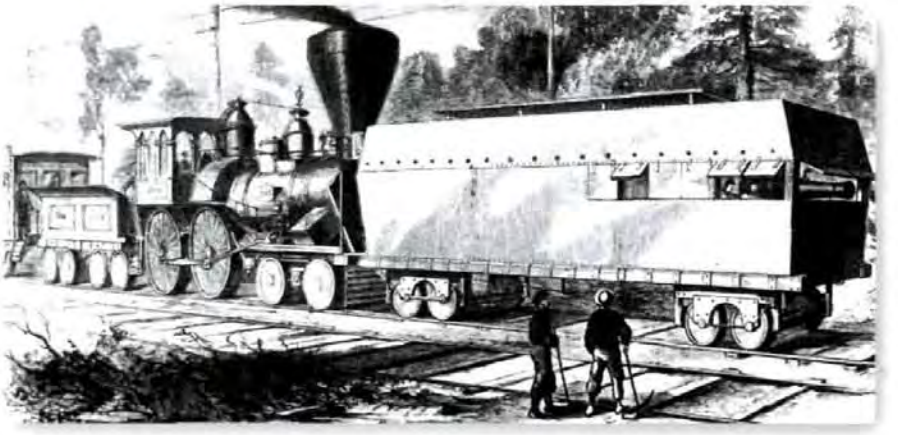
INDEX 48

ARMORED TRAINS

INTRODUCTION

The revolutionary impact of railroads on the world's armies in the 19th century encouraged the development of various types of armed train. By the time of World War I (1914–18), armored trains were one of the growing variety of armored vehicles that took their place alongside armored cars and the first primitive tanks. Russian and Austro-Hungarian armored rail-cruisers, for example, were the largest, most sophisticated, and most powerful armored vehicles of their day. Like the Zeppelin bomber, however, armored trains had a brief moment of military glory and then rapidly faded from view. Their important contribution to the evolution of mechanized warfare is not widely known in the West, as they were most successful elsewhere in the world. The armored train was a key weapon in the Russian Civil War in 1917–22, and its use there spilled over into the civil war in China in the 1920s. Armored trains were used again in World War II, but by then their heyday had passed, as they were replaced by the more versatile tank. Armored trains have made sporadic appearances in many scattered wars in the latter half of the 20th century, but more as technical curiosities than as vital means of warfare.

Armored trains reached their technical pinnacle in the 1920s and 1930s in Eastern Europe, based on the lessons of the 1917–20 wars for the Russian Empire. The Cegielski Plant in Poznan built these elegant artillery wagons for the Polish Army starting in 1921, armed with a turreted 100mm Skoda Mod. 14/19 howitzer and a rechambered Putilov 75mm Mod. 02/26 field gun, as well as nine 7.62mm Maxim machine guns.



The American Civil War saw the first extensive use of armored trains. This lithograph shows an armored train built by the Philadelphia, Wilmington & Baltimore Railroad to patrol along the line between Havre de Grace and Baltimore, Maryland, after a number of bridges along the line were burned in 1861 by Confederate sympathizers. The cannon could be pivoted to fire forward or to either side. (Patton Museum)

ORIGINS

From 1825 to 1900, the railroad network in Europe grew from nearly nothing to 186,500 miles of track. Travel to any of Europe's great cities took a day instead of weeks. Railroads also helped to solve two of the most vexing issues in the era of mass national armies – transport and supply. Railroads could move armies across vast distances with considerably more speed than the traditional army on foot. Just as important, railroads could keep armies supplied in the field at enormous distances away from the homeland.

Early military use of the railroad spawned the first schemes to build armored trains. During the revolutionary disturbances of 1848, some improvised armored trains were built by Austro-Hungarian troops, and Britain contemplated the creation of an armored train force during a war scare in 1859. The full potential of military railroads first became evident in the American Civil War in 1861–65. During the fighting around Chattanooga in 1863, Gen. Hooker was able to move his entire command of 22,000 troops some 1,168 miles from Washington DC to Bridgeport, Tennessee, in only seven days, a journey that would ordinarily have taken more than a month on foot and left the troops exhausted and unready for battle.

The American Civil War also saw significant use of armored trains in combat. The first American armored train was built to patrol the railways north of Baltimore against Confederate saboteurs, the earliest example of armored trains performing their classic role of antipartisan warfare. In June 1862, the Confederate commander Gen. Robert E. Lee instructed the commander of his artillery to construct a railway gun wagon. A Confederate Navy officer placed a 32pdr on a four-axle railcar protected by a wall of inclined steel rails and this armored battery was used in combat during the Seven Days' Battle near Savage Station (June 25–July 1, 1862). The Union Army built a larger version in 1864 using a Parrot gun, and during the siege of Vicksburg in 1864 a 13-in. mortar was mounted on a railcar. These developments were noticed in Europe and during the Franco-Prussian War of 1870–71 the Compagnie d'Orléans built an armored train with two armored wagons for 140mm guns, and used this vehicle during the siege of Paris.

Before proceeding, it is worth making some distinctions between the three main types of railroad weapon. The focus of this book is on armored trains, which are characterized by armored protection of their weapons and crew. Artillery troops eventually realized that trains could serve as platforms for

One of the more powerful armored trains of the American Civil War was this massive affair built by Union troops for the siege of Petersburg in 1864, with a large Parrot gun on a seven-axle car. (Library of Congress)

extremely heavy artillery pieces. These weapons are usually called railroad guns, but lacked armored protection so are largely outside the scope of this book. At the lower end of the spectrum are armed trains. These are simply troop or supply trains equipped with a few machine guns and sometimes a few sandbags for self-defense. These were usually temporary expedients and are also not considered here.

Armored trains began to reach maturity in the hands of British forces during the colonial conflicts of the late 19th century. The Royal Navy led the way during the Egyptian campaign of 1882, fitting railcars with guns, iron plates, and sandbags. One of the key innovations of these trains was to place an expendable railcar at the head of the train to protect the main element of the train in the event of a mine or a deliberately loosened rail. Armored trains were built by the Royal Marines in 1882 in Egypt, by the army in the Sudan in 1885 during the campaign to relieve Gen. Gordon at Khartoum, and by troops in India in 1886. These early experiments set the stage for the most important use of armored trains in the 19th century, the Boer War (1899–1902) in southern Africa.

Railroads were absolutely vital to the transport and supply of the army in British-controlled areas of South Africa, so before the war some 13 armored trains were built under the direction of the Royal Engineers by the Cape Government Railways (CGR), Natal Railways (NR), and Rhodesian Railways (RR). They were intended to move infantry rapidly to trouble spots

No doubt the most famous armored train skirmish of the Boer War involved a Natal Railways armored train of the 2nd Royal Dublin Fusiliers ambushed near Frere on November 15, 1899. This infantry car was forced off the rails by a boulder while the rest of the train managed to escape. Riding in this train at the time was the young Winston Churchill, a journalist for the *Morning Post*, who was captured. The armored side plates folded upward when the wagon overturned. (Australian War Memorial P00653.030)

The Royal Navy was instrumental in the formation of several armored trains during the colonial wars of the late 19th century. This *armored train in Natal in* 1900 was armed with a Maxim pom-pom gun as well as a naval gun. (Australian War Memorial P00653.018)

and to allow the infantry to fight from within the trains. The trains typically had two or more wagons fitted with steel plates, with loops through which the infantry could fire their rifles.

These armored trains proved useful in the early fighting, though they were far from invulnerable against a determined enemy. The best-known action took place on November 15, 1899, when an NR armored train of the 2nd Royal Dublin Fusiliers was sent on a reconnaissance mission to monitor the southward advance of Boer forces. Gen. Louis Botha ordered a Boer militia force to block the train near Frere, while his troops launched an ambush from behind the train. When the train attempted to withdraw, it ran into a large boulder placed on the tracks by Botha's task force, and one of the armored infantry wagons was derailed. The armored train was then blasted by the Boers, who were armed with two field guns including a Vickers-Maxim pom-pom. The armored train's own 7pdr gun was knocked out of action, but the armored locomotive was eventually able to push past the obstruction, leaving behind the derailed truck. Botha's task force captured over 50 British troops as well as a journalist from the British *Morning Post* newspaper, the young Winston S. Churchill.

This skirmish highlighted the vulnerability of armored trains to ambush and made it clear that they could not operate independently against a skillful enemy without their own reconnaissance force. Tactics and technology continued to evolve; cavalry was often used to provide the route reconnaissance.

One of the more curious innovations during the Boer War was the use of protective carpets made of heavy rope to protect the locomotive from small-arms fire, resulting in the "Hairy Mary" seen here. (Australian War Memorial P01328.012)

The usefulness of armored trains in patrolling the vital railroads led to further construction, and at their peak strength during the war as many as 20 armored trains were operational.

A postwar study of the conflict concluded that the armored train had seven main missions – accompanying and supporting infantry columns attempting to intercept the enemy; serving as flank protection to infantry columns; reinforcing camps and stations on the railroad; escorting ordinary trains; reconnoitering; patrolling day and night; and general protection of the rail-lines. The improvement of train tactics enhanced their effectiveness and one officer later commented that "There is no doubt that the enemy disliked them intensely and that the presence of an armoured train had a great morale effect." The character of the armored trains in combat was well summarized in the official British history of the campaign:

Two heavy armored trains were built by the Royal Navy's Naval Division and manned by British and Belgian personnel during the siege of Antwerp in September 1914. Each was armed with a British 4.7-in. naval gun and had armored parapets on either side to protect the infantry. (NARA)

> It was important that the officer commanding the train should be a man of judgment and strong nerve. He was often called upon to act on his own responsibility. His strong armament and defences enabled him to attack superior forces. Yet his vulnerable points were many. He had ever to be alert that the enemy did not cut the line behind him. In addition to his visible foes and the constant risks of traffic in wartime, he had to contend with skillfully-used automatic and observation mines, and had to keep his head even amid the roar which followed the passage of his leading truck over a charge of dynamite, and then to deal with the attack which almost certainly ensued. Officers, therefore, had to be chosen from men of no common stamp. The danger from contact mines was to a certain extent obviated by a standing order that each train should propel a heavily-loaded bogie truck. Such trucks had low sides and ends; they in no way obstructed the view or fire from the trains; and they performed the double purpose of exploding contact mines and carrying railway and telegraph materials [for repair].

A

ARMORED TRAINS, 1915–18

1. Austro-Hungarian Pz.Zug II, 1915
2. Russian *Bronepoyezd Khunkhuz*, 1915
3. Soviet BP No.10 *Roza Luksembourg*, 1918

Pz.Zug II (1) established the classic elements of the Austro-Hungarian armored trains with its distinctive turreted artillery wagon with 70mm gun. The locomotive is an armored version of the common MÁV 377. *Khunkhuz* No.1 (2) was the lead train for this class. This is a partial view of the train; in practice it would have an additional artillery car on the back end of the armored locomotive. The armored locomotive is the classic Ov *Ovechkoi*. BP No.10 *Roza Luksembourg* (3) was named after the famous German communist leader and served mainly on the Turkestan front fighting the *basmachi* Muslim partisans. It was powered by a typical Sormovo-pattern armored Ov locomotive and the distinctive Sormovo-pattern artillery wagon armed with turreted 3-in. mountain guns and numerous firing embrasures along the superstructure. This is only a partial depiction of its configuration, as it would also generally have control cars at either end as well as a second artillery car behind the locomotive.

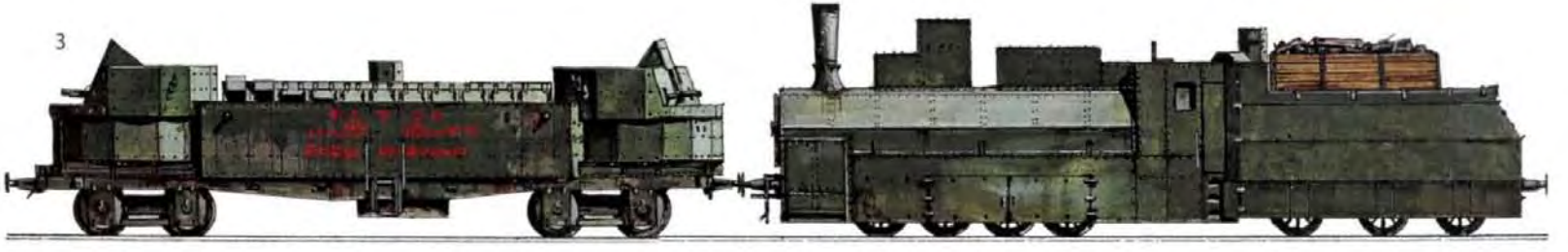
1

2

ЖУЖУЗЪ

Р. С. Ф. С. Р.
"ЦЕНТРО БРОНЕВОЙ" "БРОНЬ"
ПОЕЗД №10
"РОЗЫ ЛУКСЕМУРГ"

3



ABOVE
This is one of the characteristic artillery cars built by MAVAG (*Magyar Királyi Államvasutak* Gépgyára; Hungarian Royal State Railroads' Machine Factory) for the Austro-Hungarian armored trains. It was armed with a 70mm *Panzerzug-Kanon* L/30, supplemented by a machine gun in the observation cupola and two more on either side.

ABOVE RIGHT
German armored trains tended to be more primitive than their Russian and Austro-Hungarian counterparts. This is PZ 1 or 2 on the Romanian front in 1916, armed with captured Russian Putilov 76.2mm Mod. 02 field guns in traversable armored "dog-houses." (NARA)

In spite of the extensive use of armored trains during the Boer War, there was little enthusiasm in the British Army for their further development for operations in Europe. The consensus was that they were valuable in colonial settings against irregular forces, but that on a European battlefield, they would have little use due to their vulnerabilities.

WORLD WAR I

None of the major armies in Western Europe had plans to make use of armored trains at the time of the outbreak of World War I. Nevertheless, some sporadic use did take place in the first few months of the war before the Western Front congealed into trench warfare. The Belgian Army had constructed two light armored trains, and when Britain's Naval Division arrived, two more were constructed by mounting a few naval guns on flatcars with a low armored parapet. These went into action in late September 1914 with a mixed British and Belgian crew during the fighting around Antwerp. The Germans assembled some improvised armored trains near Belfort in August 1914, and some armed trains in Belgium to protect the railroads against "francs-tireurs," but they saw little if any combat.

On the Eastern Front, the situation was much different. The Russian Army had shown more enthusiasm for armored trains than most of the Western European armies, in no small measure due to the lack of roads through most of the Russian Empire. Some armored trains had been assembled at the time of the Boxer Rebellion (1899–1901) in China, and the Ministry of War supported the development of armored railroad batteries that saw service in the defense of Port Arthur during the war with Japan in 1904–05. In 1912, work began on the construction of four standardized armored trains at the Obukhov Works. These were based around an armored locomotive, two or more armored wagons armed with machine guns or small-caliber cannon, and two control cars, which were flatcars pushed ahead of the train for security, and were based on the British experience in the Boer War. The armored trains were deployed to the Polish provinces in 1914 to oppose the German and Austro-Hungarian armies. The first to see service was the 9th Railway Battalion's armored train during operations around Lvov. The train took part in an assault on a key bridge near Stanislav, for which the commander was

decorated. During the fighting for the Koluszki station in late November 1914 near Lvov, the 4th Railway Battalion's armored train managed to repel a German infantry attack and then pursue the Germans, allowing the station to be captured by the 6th Siberian Division. When Russian forces in the area were surrounded, the armored train was used to facilitate the escape of the corps headquarters. In the summer of 1915, the 3rd Railway Battalion's armored train was used extensively in the defense of Brest-Litovsk.

These Russian armored trains were so successful that the Austro-Hungarian Army decided to follow suit. The first Austro-Hungarian armored train, the improvised Panzerzug I (Pz.Zug I), was assembled in the winter of 1914–15 by Magyar Államvasutag (MÁV; Hungarian Railways). A tender was modified into a gun car to lead the train, followed by infantry cars protected by steel rail. The next design, Pz.Zug II, was a more sophisticated design, and by 1916 some ten armored trains had been assembled. They served on the Russian, Romanian, and Italian fronts with distinction. For example, on September 15, 1915, Pz.Zug II was used to assault the Babinrub tunnel on the Isonzo Front, blasting an Italian blockhouse with its guns while its infantry assault detachment disembarked and set fire to the tunnel.

The German Army on the Eastern Front built its first improvised armored train, with crude sandbag protection, in the autumn of 1915 in East Prussia. In 1916, construction began on Pz.Zug I and II for operations on the Romanian front. In contrast to the Austro-Hungarian and Russian armored trains, the German trains were local improvisations rather than refined industrial designs.

The value of the armored trains in the autumn 1914 fighting prompted the Russian Army to begin building an armored train for each of its railway battalions. The Eastern Front did not develop into the same type of trench-war stalemate as the Western Front, and armored trains remained valuable as a mobile shock force that could be used for conducting sudden raids, or rushed to trouble spots to bolster defenses. Russian armored train design evolved from the early fortress pattern based around armored infantry wagons with numerous firing slits, to a warship configuration using one or more turreted guns with multiple machine guns in place of infantry firing slits.

One of the most active and innovative units was the 2nd Zaamurskiy Railway Brigade of the Southwest Front commanded by Gen. Maj. Mikhail

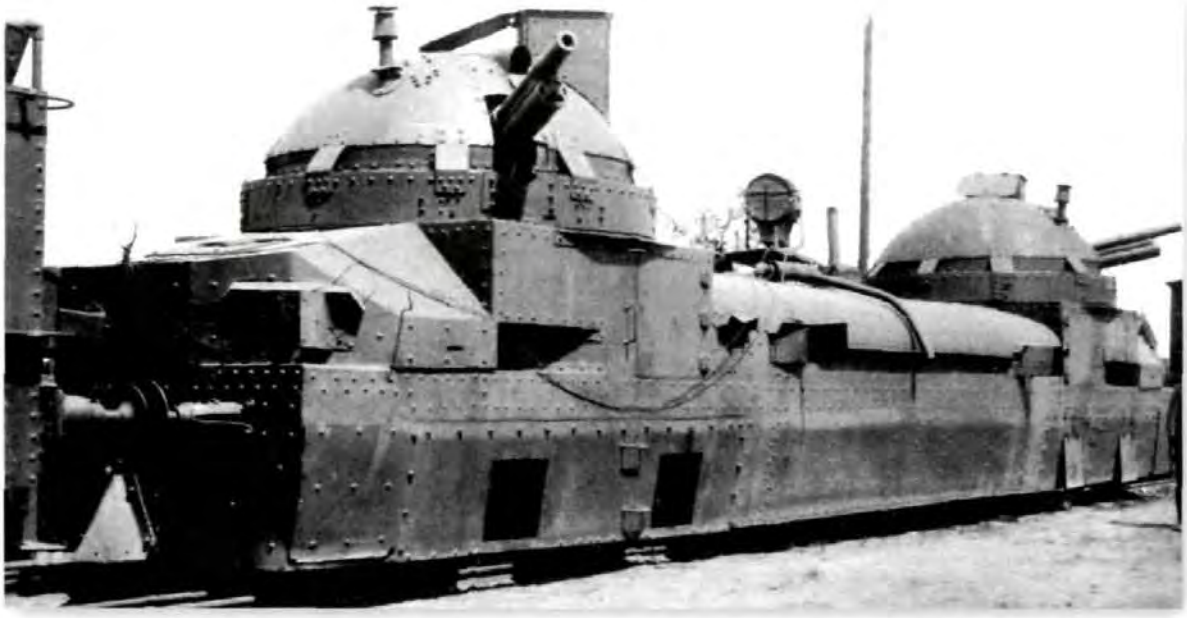
Another armament option on German armored trains like PZ V, seen here, was mounting a *Gruson armored pillbox in an Omk(u)-Wagen* with its dome-shape cupola and 53mm gun exposed at the top. This train also has one of the typical 76.2mm guns in an armored "dog-house." (NARA)

The first of the standardized Russian armored trains to appear in service was the *Khunkhuz* class, which served on the Southwestern Front in eastern Poland and western Ukraine starting in the autumn of 1915. The turreted 76.2mm gun in the front had a wide field of fire, and was supported by numerous Maxim machine guns.

Kolobov and supported by the Kiev Main Railroad Workshop. The first of the new trains, the *Gen. Annenkov*, was built in June–October 1915 with a turreted 3-in. field gun in its main artillery wagon. Kolobov also developed the standardized *Khunkhuz* design using a smaller wagon armed with a less powerful 3-in. mountain gun. Four of these *Khunkhuz* trains were built in Kiev, first going into combat in September 1915. Other units built their own designs, and by the end of 1915 the Russian Army had 15 operational armored trains, one in Finland, one on the Northern Front, one on the Western Front, eight on the Southwest Front, and four in the Caucasus.

The most remarkable armored trains of World War I were the armored rail-cruisers built by Austria-Hungary and Russia. These were self-propelled railcars with turreted weapons resembling a railroad tank. The inspiration for these came from the prewar *automotrice*, a self-propelled passenger car first developed in France. An Austro-Hungarian rail-cruiser was constructed in 1916 and formed part of Pz.Zug IX before being lost to artillery fire during the

The finest Russian design of World War I was undoubtedly the *Zaamurets* armored rail-cruiser. Its anabasis took it from the Carpathian mountains of Central Europe across Siberia to China. This photo of it was taken by a US Army military attaché in China 1925 with it still carrying its name from its Czech Legion service, *Orlik*.



Romanian offensive on August 27, 1916. Gen. Kolobov had long argued that small, self-propelled armored rail vehicles would be more versatile than multi-car trains, and in September 1915 the Russian high command authorized the construction of seven to eight small armored machine-gun trolleys as well as a single armored rail-cruiser. The little armored trolleys did not prove to be particularly effective in combat except for scouting, and construction ended after only three had been manufactured. A Russian armored rail-cruiser, eventually named *Zaamurets* ("from the Amur Region"), entered construction in January 1916 in the Odessa railyards and used a large flatcar with two Pullman-pattern two-axle railroad trucks. The cruiser was powered by two Fiat 60hp automobile engines with a specially designed transmission and had a maximum speed of 28mph. The primary armament was a pair of fully traversable turrets armed with 57mm Nordenfeldt guns with a rate of fire of 60 rounds per minute (rpm). Although it saw some fighting in 1916–17, its fame would come from its incredible career in later years.

The most futuristic of the Austro-Hungarian armored rail-cruisers was this *Motorkanonwagen* (motorized cannon car) built on the 303.343 *automotrice* and armed with a turreted 70mm Skoda gun. It was lost during fighting on the Romanian front in 1916.

THE RUSSIAN CIVIL WAR

The most intensive use of armored trains took place during the Russian Civil War from 1917 to 1922. Unlike the Western Front in World War I, where massed armies faced one another in relatively confined areas with concentrated firepower, the civil war in Russia usually involved poorly armed militias and paramilitary groups fighting over vast areas. As a result, mobile tactics using armored trains and cavalry were characteristic of the fighting rather than trench warfare. Russia had few roads and few automobiles, so the transport of troops and the movement of supplies depended on rail transport. At the turn of the century Russia was still industrializing, so most of the major new cities and towns sprang up along the railroads and most battles were fought along these lines of communication. Armored train tactics reached their maturity during this conflict, and for most effective use an armored train operated as part of a small combined-arms task force with organic infantry and cavalry detachments to support the train and to continue the fight where the train could not go.

Bolshevik armored trains ran the gamut from crude improvisations through sophisticated multi-turreted designs. This is a fairly typical example of an armored train – *Vtoroy Sibirskiy* (Second Siberian), the former *Khunkhuz* No.2 rebuilt in Tsaritsyn in October 1918 with a 3-in. field gun replacing its old and damaged turret. Its crew came from the 2nd Siberian Artillery Battery and the train fought on the Tsaritsyn front with the Thirteenth Army, later being renamed as BP No.19.

Armored trains formed by sailors were a common feature of both Red and White forces in the Russian Civil War. Their ships provided a handy source of deck guns that could easily be mounted on flatcars, as seen here on a White Russian armored train of the Army of Siberia in January 1920, built in the Vladivostok naval yard. (NARA)

The new Red Army that was formed after the Bolshevik seizure of power in October 1917 inherited few of the armored trains of the former Russian Army. Most were either taken over by the German Army when they advanced into Ukraine after the Brest-Litovsk Treaty in March 1918, or they were seized by local militias and White Russian (anti-Bolshevik) forces. The first two Bolshevik armored trains, BP No.1 and No.2 (BP: Bronepoyezd: armored train; "BP" was pronounced "BePo"), were built at the Putilov Works in Petrograd in October–November 1917. By 1918, the Bolsheviks controlled most of Russia's industrial facilities and the two key plants for Bolshevik armored trains were the Putilov Works and the Bryansk Machine Plant, which in 1919 was assigned the central role in armored train design. Armored trains were assembled in many locations, especially at major rail facilities in Kolomna, Gorlovka, Lugansk, Mariupol, and Ekaterinoslav.

The early armored train designs were incredibly diverse. At the basic end were trains crudely protected using sandbags, concrete armor, and boilerplate, and armed with whatever field guns and machine guns were at hand. At the same time, the railroad yards began constructing sophisticated designs based on the earlier Tsarist armored trains, with turreted artillery wagons and steel armor. The confusing variety of these early trains prompted a Red Army directive in the autumn of 1918, which stipulated that armored trains should conform to the traditional 1915 Russian Army pattern with an armored locomotive, two artillery wagons, and two or three control cars for security at the front. This instruction proved impossible to enforce under the chaos of civil war conditions, and on January 4, 1919, the Red Army made yet another attempt to standardize the armored trains, this time recognizing three standard types. Train No.1 was the classic 1915 pattern with two artillery wagons and an armored locomotive in the center, typically armed with two or more 3-in. field guns and 12 machine guns. Train No.2 encompassed heavier weapons, often 4-in. or 6-in. naval guns on pedestals. Train No.3 was intended to serve as an armored train reserve and was a supply train used for transporting and housing the armored train crew and its supplies. By the end of 1918, the Red Army had 23 armored trains, 59 at the end of 1919, and 103 at the end of 1920. In total, about 300 armored trains were formed during the course of the civil war, of which about 75 were standardized designs built at the railroad plants and the remainder improvised or local designs. Besides the combat detachment, many armored trains also possessed a support element, officially termed the "base." This was a separate train with passenger and freight cars to support the armored train and its crew.

The armored trains were by far the most complicated and expensive weapons operated by the Red Army and undoubtedly the most effective. During the fighting for Tsaritsyn (later Stalingrad) in the autumn of 1919, the Red Army commander there wrote: "Armored trains fight bravely and desperately, if we ever win this battle it will be thanks to the armored trains."

Their opponents felt the same way. A Polish account from the 1920 fighting concluded: "In the recent battles, armored trains were the most serious and terrible adversaries. They are well-designed, act shockingly, desperately and decisively, have large amounts of firepower and are the most serious means of our enemies' tactics. Our infantry is powerless against enemy armored trains." By 1920, nearly one out of every ten field guns in Red Army hands was mounted on an armored train. Against poorly trained opposition, the sudden appearance of an armored train bristling with cannon and machine gun could have a decisive effect in a skirmish. The armored train crews became the Red Army's mobile shock force, able to move rapidly from one hot spot to another. The crews of such trains soon developed their own mystique, wearing the distinctive black leather coats of an elite force. It is little surprise that the anti-hero of Boris Pasternak's acclaimed novel of the civil war, *Doctor Zhivago*, is the relentless Bolshevik armored train commander, Strelnikov.

The most important tactical innovation in armored train warfare was the formalization of raiding teams. Since 1915, it had become the tactic of Russian armored trains to dispatch small infantry sections on armored trains to disembark at critical points in the battle to clear enemy trenches or conduct other types of mission. In October 1919, this practice was amplified by instructions to assign each armored train a *desantniy otryad* (raiding team). The raiding team typically consisted of an infantry company of 165 troops and a cavalry troop with 47 sabers supported by a machine-gun section with two *tachanki* (machine-gun carts). The role of the raiding team was both defensive and offensive. When the train was at rest, it was the responsibility of the raiding team to provide site security. During movement, the raiding party, especially the cavalry troop, could be disembarked to scout for the train and to detect ambushes or sabotaged track. In combat, the raiding team expanded the offensive footprint of the armored train, since the infantry company could conduct missions away from the train while under the cover of its protective firepower. Red Army officers concluded that an armored train with such a raiding party was five times more effective than a train without one. At first, the raiding party was stationed with the supply train, since there was not enough space on the armored train itself. As resources became available, however, armored trains began to have special cars added to carry the raiding party into combat with the main element of the train.

Few trains are more representative of the confusing conditions of the Russian Civil War than the *Orlik*. At various times it served with anarchist, Ukrainian nationalist, German, and Bolshevik forces, finally ending up in Czech Legion hands during the fighting along the Trans-Siberian rail-line. This view shows one of its artillery cars from the standard *Khunkhuz* series, while in front of the armored locomotive can be seen the *Zaamurets* armored rail-cruiser that was sometimes attached to the main train and sometimes operated independently.

While many armored trains in the Russian Civil War used steel and iron plate armor, another common technique was to build a hollow wooden wall, fill it with concrete, and add a concrete roof overhead. This is a concrete-armored infantry car of the White Russian armored train *Mstitel* (Avenger) of Kolchak's Army of Siberia in Vladivostok in January 1919. It was later captured by the Red Army on October 25, 1922, during the final battle for Vladivostok. (NARA)

A novel method of train reconnaissance was the use of observation balloons tethered to a special flatcar. They were first used for artillery spotting by BP *Chernomovets* ("from the Black Sea region") on the Debaltsevo front in March 1919. The balloons were most heavily employed in the July–September 1919 fighting and at least eight trains had balloons attached during these campaigns. A typical example was the 23rd Air Unit attached to BP *Volga* during the fighting on March 7–24, which conducted 73 sorties lasting 201 hours, of which 63 sorties were for scouting and ten for adjusting artillery fire. Balloons proved to be particularly effective in engagements with White Russian trains.

Besides the Red Army armored trains, the various White Russian armies also constructed as many as 80 armored trains. The Armed Forces of South Russia had the largest armored train force, commanded by Gen. Maj. M. Ivanov. Ivanov's force grew to ten armored train battalions by the end of 1919; each battalion had two light trains and one heavy armored train. The Don Army raised its first Armored Railway Brigade in 1918, consisting of four armored train battalions plus two independent armored trains. The configuration of these trains varied considerably. Some resembled the Bolshevik trains in general outline, while others were based on flatcars armed with pedestal-mounted naval guns taken from Russian warships in the Black Sea and Pacific ports.

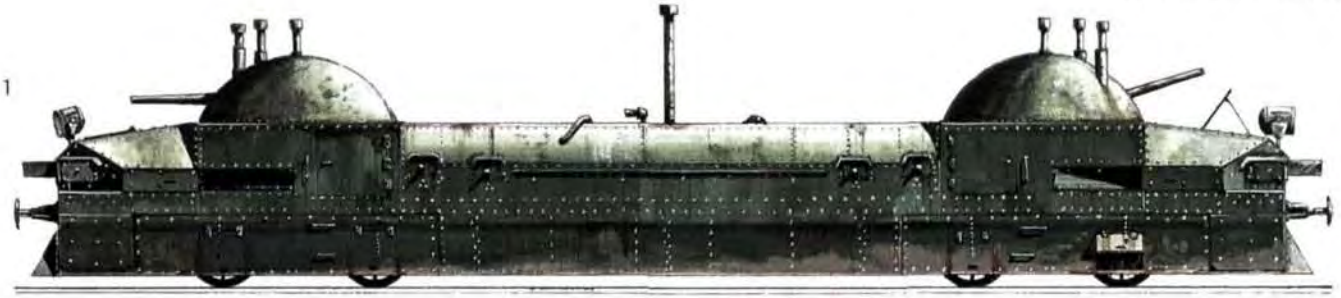
Although the mission of armored trains was not to fight other armored trains, there were inevitably clashes between Red and White armored trains

B

ARMORED RAIL-CRUISER *ZAAMURETS*

1. *Zaamurets*, Tsarist Army, 1916
2. *Orlik Vuz cis.* 1, Siberia, 1918
3. Armored Train No.105, Manchurian Army, 1931

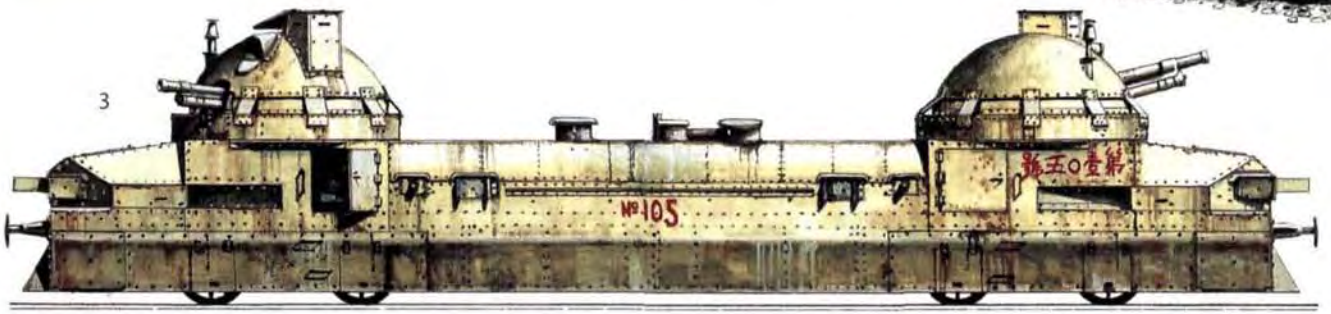
The top illustration shows *Zaamurets* in its initial configuration after construction in Kiev. In September 1917, it was rebuilt at the Odessa yards where the turret was raised for better clearance. *Zaamurets* was in this configuration at the start of the Russian Civil War and remained so through the time that it was captured by the Czech Legion in July 1918. It was modified by the Czechs shortly afterwards when they ran out of 57mm ammunition for its main guns. The new configuration (2) used the ubiquitous Putilov 3-in. field gun. The final plate shows the *Zaamurets* in its last known configuration at the time of its capture by the Japanese Kwangtung Army from the Manchurian Army. At the time it was known simply as No.105, and this is repeated in both Roman script at one end, and in Chinese at the other end.



ORLIK
VUZ CIS.I.

第壹五〇號

ORLIK
VUZ CIS.I.


№105
第壹五〇號

during the Russian Civil War. There is no more colorful example of armored train combat than the extraordinary story of the *Zaamurets* armored rail-cruiser mentioned earlier. When the Bolshevik revolution broke out it was in the Odessa railyard undergoing repair, and various accounts later put it in the hands of Ukrainian nationalist militias, Bolshevik revolutionaries, or German forces in Ukraine. In early 1918, the Germans turned over BP No.3 of the *Khunkhuz* series to an allied Ukrainian unit of *hetman* (warlord) Skoropadskiy, and they named the train *Slava Ukraina* (Glory of Ukraine). This train was quickly lost to a detachment of Bolshevik Black Sea Fleet sailors under Andrey Polupanov near Kiev on January 26, 1918. (Armored trains captured in battle were simply renamed and placed back into service under a new flag.) It was subsequently derailed during fighting with anarchists in February, but was recaptured by the Bolsheviks in March 1918. It was directed to Tiraspol in Bessarabia on March 10, 1918, to fight against Romanian forces. On returning to Odessa for repairs, it was joined with *Zaamurets* in a configuration that would last for nearly a decade. It was eventually designated as BP No.4 and variously called *Polupanovtsy* (Polupanov's Boys) and *Smert ili Svoboda* (Death or Freedom). Later in March it fought against German troops, being damaged by artillery for the second time. It was sent to the Kolomna yards for repair and subsequently was dispatched to the Southern Front with the 1st Revolutionary Army.

One of the strongest forces in Russia and Ukraine was the Czech Legion, formed from Czech soldiers of the former Austro-Hungarian Army who had defected or surrendered to the Russians prior to the start of the Russian Civil War. In March 1918, the new Bolshevik government under V. I. Lenin had agreed to allow the transfer of the Czech Legion out of Russia via the Trans-Siberian Railroad, since exit westward was blocked by the German Army. There was mutual suspicion between the Bolsheviks and the Czech Legion, and in May 1918 fighting broke out between the Red Army and the Czech Legion over an incident in Chelyabinsk. Although substantially outnumbered, the Czech Legion had the advantage of cohesion and discipline at a time when the Red Army was little more than a motley collection of workers' militias,

The first Polish armored train, the *Piłsudczyk*, was constituted from components of Austro-Hungarian armored trains captured in 1918. This photograph shows the infantry assault car to the rear, the artillery car in the center, and the control car in front.

Sikorski is a good example of the type of improvised armored train of the border wars around the old Russian Empire. It was formed in May 1920 in Kalenkowicze using elements of a Bolshevik armored train captured by Gen. W. Sikorski's 9th Infantry Division. The lead artillery car has been created by roofing over a freight car and installing a Russian Putilov 3-in. field gun in front. The second artillery car is a more elaborate design with a turreted 3-in. gun. This train was lost on June 26, 1920, after being ambushed by artillery of the Bolshevik 24th "Iron" Division near Sloweczna.

brigands, and deserters. The Czech Legion began systematically to take control of the Trans-Siberian Railroad, using improvised armored trains as their principal weapons due to their speed and mobility in the harsh winter and early spring conditions. Polupanov, now Bolshevik chief of Kiev, was ordered by the Red Army to take parts of BP No.4, now renamed *Lenin*, to Siberia to help defeat the Czechs. The train consisted of *Zaamurets*, an armored locomotive, and two *Khunkhuz* artillery wagons. Hardly had the train arrived when BP No.4 was captured on July 22, 1918, by the Czech Legion during the fighting for Simbirsk. It was renamed *Orlik* (Young Eagle) and was the most powerful armored train in Czech hands. Since *Zaamurets* could operate independently, the train was often split up for operations, with the former *Zaamurets* section being called *Orlik Vuz cis. 1* (Vehicle Part 1). Once the supply of 57mm ammunition ran out, *Orlik* was rearmed with standard Putilov 3-in. Model 1902 field guns. *Orlik* fought through the summer and autumn of 1918 to capture the Trans-Siberian Railroad, and through most of 1919 it was used to patrol the railroad to stymie Bolshevik raids. In April 1920 it served as a rearguard during the final withdrawal of the Czech Legion for evacuation through Vladivostok. While in the Manchurian town of Chaytar, *Orlik* was seized by Japanese troops even though they were supposed to be allies of the Czechs. After diplomatic intervention, the train returned to Czech hands.

Before the Czech Legion departed Vladivostok, they left *Orlik* in the hands of White Russian forces to avoid its recapture by the Japanese. It remained in the Vladivostok area through October 1922, when the city fell to the Bolsheviks. The White Russian forces had been negotiating with Zhang Zoulin, the Chinese warlord who controlled the Fengtian Army in neighboring Manchuria, and when they evacuated Vladivostok they took their armored trains with them to Harbin, including *Orlik*. In 1924, Gen. Lt. K. P. Nechayev, part of *Ataman* (warlord) Semyenov's army, formed a mercenary White Russian contingent of the Fengtian Army during the Second Zhili-Fengtian War (1924). An armored train division was formed under Col. Chekov with seven armored trains, including *Orlik*. The *Zaamurets* later served with various Chinese units and was known as Train No.105. It was captured by the Japanese Kwantung Army in 1931, and then the *Zaamurets* disappeared into the mists of history, having fought across the Eurasian mainland from the Black Sea to the Pacific in its remarkable odyssey.

WAR OF THE EMPIRES

The collapse of four of the great imperial powers – Germany, Austria-Hungary, Russia, and the Ottoman Empire – in 1917–18, led to a series of wars in Central and Eastern Europe as nations attempted to redraw national maps. As in the Russian Civil War, armored trains played a vital role in most of these wars. Outside of Russia, Poland had been the most active in the development of armored trains. This is not altogether surprising, as the Poles had contact with both Russian and Austro-Hungarian armored trains, which were in the forefront of this technology. Polish officers serving in the Tsarist army had been involved in early Russian armored train construction, and a number of Austro-Hungarian trains fell into Polish hands following the declaration of Polish independence in November 1918. In total, Poland built about 80 armored trains, including about 60 armored locomotives and 300 armored railcars. The Poles also captured 37 armored trains in 1918–20, including 31 Bolshevik armored trains and smaller numbers of Austro-Hungarian, Ukrainian, German, and Lithuanian trains. At the end of 1918, the Polish Army had seven armored trains, 31 by the end of 1919 and 43 at peak strength in the autumn of 1920.

The first armored train formed in Poland was PP Nr.1 *Piłsudczyk* (PP: *Pociag Pancerny*: armored train), named after the Polish military commander Josef Piłsudski. The core of this train was formed after Polish insurgents seized the Austro-Hungarian Pz.Zug V in Prokocim station in late October 1918. It was dispatched to the Ukrainian front where it was instrumental in the capture of the old fortress city of Przemysł from the Western Ukrainian Peoples Republic. *Piłsudczyk* then took part in the fight for the city of Lwow where it was divided in two, the second portion being renamed PP Nr.2 *Smiały* (Bold). It remained active on the Ukrainian front through 1919–20, and during the 1920 offensive into Byelorussia the train was used in an attack on the critical rail junction near Mozyr, where six Bolshevik armored trains were based. During this battle, two Bolshevik armored trains were captured. During the Bolshevik counteroffensive in the summer of 1920, *Piłsudczyk* served as a rearguard for retreating Polish forces and in July fought a series of engagements with Bolshevik armored trains. During these skirmishes, *Piłsudczyk* fought a duel with the Bolshevik armored train *Krasnoarmiyetz* (Red Soldier), disabling it when an artillery round struck the ammunition

Chinese armored trains had a decidedly Russian flavor, as most were former White Russian trains evacuated in 1920–22 or new trains built by mercenary Russian specialists. Here is the *Hupeh*, which was built for warload Zhang Zongchang of the Fengtian Army but changed hands several times during the vicious fighting in the late 1920s.

car, resulting in a spectacular explosion. In total, the *Piłsudczyk* captured four Bolshevik armored trains during its career, and its commander, Lt. Włodomierz Abłamowicz, was decorated with Poland's highest military award, the Virtuti Militari. Interestingly enough, *Piłsudczyk* also fought a combined-arms battle alongside Renault FT tanks of the Polish 1st Tank Battalion during the defense of the Seret River bridgehead near Tarnopol on August 4, 1920. Following the end of the Russo-Polish War (1919–21), *Piłsudczyk* was sent west along the contested Silesian border with Germany, intervening during the third Polish insurrection in Silesia where German armored trains were also active.

The combat career of *Piłsudczyk* was typical of Polish armored trains during this period. In general, the Polish armored trains operated much like the Bolshevik armored trains, consisting of the combat train and a supporting supply train. The armored train had 100–150 troops and included a landing party of three assault platoons with 15–20 infantrymen each. While the trains usually fought as independent units, two armored train battalions were formed that operated two or more armored trains. Another Polish practice was to mount Renault FT light tanks on flatcars. These could fight from the armored train or, in the right circumstances, they could be disembarked to support the train.

Although the Polish Army operated the most armored trains of the resurrected nations, nearly all other armies on the periphery of Russia operated several armored trains, including Lithuania, Estonia, Latvia, and Finland. The German Army had not been especially enthusiastic about armored trains prior to 1917, but after the treaty of Brest-Litovsk, the German forces surged into Byelorussia and Ukraine and the mobile conditions encouraged a more active use of armored trains. These were mostly improvised armored trains, and saw extensive use until the end of the war in 1918. The Ukraine presents a particularly complicated story as there were several different governments and armies in 1918–20, often operating improvised armored trains and fighting against the Bolsheviks, Poles, and other Ukrainian formations. While most of the armored train combat took place along the periphery of the Russian empire, armored trains were also used in combat in Central Europe – German and Polish militias formed improvised trains which saw combat in the contested borderlands of Silesia and Pomerania.

The Japanese Kwantung Army captured many of the armored trains of the former Fengtian Army when it took control of Manchuria in 1931. This is *Shan-tung* of the Chinese 4th Armored Train Battalion. Some of these trains remained in Japanese service, while others were turned over to the army of the Manchukuo puppet state.

ARMORED DRAGONS

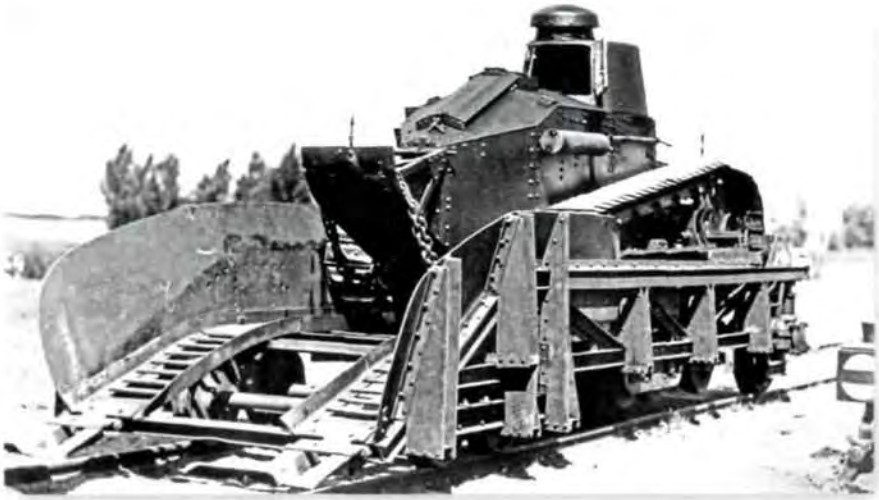
The most widespread use of armored trains after the end of the Russian Civil War was in China. The 1920s were a turbulent period in Chinese history, with warlords controlling many regions and fighting one another for the spoils. The first armored trains were spotted by US military attachés in March 1920 along the Beijing–Hankow rail-line.

ABOVE
The Japanese Kwangtung Army made extensive use of armored rail vehicles for patrolling China's vast rail network. The most common was the convertible Type 91 So-Mo armored car, which could ride on rails as seen here, or on roads by reattaching the rubber tires stowed on the side of the hull.

ABOVE RIGHT
The most sophisticated Japanese rail vehicle of the China conflict was the Type 95 So-Ki, a convertible armored personnel carrier that could travel on its tracked suspension or unfold a set of steel wheels from its underbelly to ride on rails. This example is preserved at the Kubinka museum in Russia.

These were ordinary flatcars reinforced with two layers of soft steel. The Chinese use of armored trains was stimulated by the arrival of White Russian military units after the fall of Vladivostok in 1922, and their later employment as mercenaries by various Chinese warlords. The vastness of the Chinese hinterland, the scattered nature of the fighting, and the central importance of railways all encouraged the construction of more armored trains. The warlord most closely associated with armored trains in China was Zhang Zuolin who created the Fengtian (Shenyang) Army to establish his control over Manchuria. When the White Russian armored trains evacuated Vladivostok in 1922, they were mainly hired by the Fengtian Army. Apart from the direct transfer of Russian trains, the Fengtian Army also contracted Russian specialists to build armored trains in Chinese railyards. Among the most effective Fengtian commanders was the "Dogmeat General," Zhang Zongchang. Zhang employed Russian specialists to help in the design and construction of three Russian-pattern armored trains in the railyards in Shangdong, the *Yangtze River*, *Hupeh*, and *Great Wall*. The Fengtian Army's main adversary was Chiang Kai-Shek's National Revolutionary Army (NRA), which was trying to unify China under the Kuomintang Party. Not to be outdone, the NRA approached the Soviet government and by 1925 had acquired about 1,000 Soviet advisers, including armored train specialists who helped in the construction of NRA armored trains.

The fate of the three Fengtian trains is a good example of the Chinese war of the rails. All three armored trains were used in the fighting for Shanghai in 1927. The first to fall was the *Yangtze River*, which was surrounded by NRA units in April 1927. After it was captured, its crew was shot, as was the custom, and the train put into NRA use. The *Great Wall* was also surrounded and tracks cut on either side, leaving it only a 3-mile stretch on which to operate. After running out of ammunition, the train was stormed, and the crew captured and executed. The *Hupeh* served as a rearguard at Peng-pu, where it was surrounded and the crew killed after surrendering. The NRA used undamaged portions of the three trains to form two armored trains, one named *Chung Shan*. These were used by the NRA in fighting with the Fengtian Army, but in July 1927 the *Chung Shan* was captured by Fengtian forces, who renamed it as the *Hupeh* and turned it over to Tupan Yu-pu, warlord of Zhili province. While its subsequent fate is not certain, it



One of the more novel innovations developed for Polish armored trains were these specialized tank cars powered by the tank's tracks; there was a special ramp for the tanks to provide easy access on and off the car. This version was built for the Renault FT light tank.

apparently fell back into NRA hands a few years later. The NRA finally pushed the Fengtian Army out of Beijing in June 1928 and Zhang Zuolin was killed by a bomb planted under his railcar by a Japanese officer of the Kwantung Army later that month. Zhang's death marked a turning point in the civil war, and by 1930, most of the fighting was over. The NRA consolidated its armored train force and in June 1930 it deployed five battalions with two to three armored trains each, plus eight independent armored trains, for a total of 20 armored trains. In addition, the allied Manchurian Army deployed two armored train corps with three battalions each, for a total of 12 more armored trains.

Hardly had the Chinese civil war ended when conflict erupted with Japan. In 1931, the Japanese Kwantung Army seized Manchuria and took over many of the armored trains of the Manchurian Army. The Kwantung Army had built a small number of improvised armored trains in the 1920s, but the expansion of the war in China after 1931 encouraged more serious efforts. As in the case of the Chinese civil war, most of the fighting took place along the rail-lines, so armored trains were invaluable not only for offensive operations, but also for patrolling the vast stretches of railroad lines. Aside from numerous improvised and captured armored trains, the Kwantung Army built two sophisticated designs in 1933, the *Rinji Soko Ressha* (Special Armored Train) of the 2nd Armored Train Detachment in Manchuria and the massive Type 94 armored train, which served with the 1st Armored Train Detachment from 1934.

German armored trains in 1939 were primitive compared to their Polish counterparts. This is the artillery car of PZ 4, armed with a 37mm gun in the lower turret and a 75mm IG 18 infantry gun in the upper turret. (MHI)

The Kwantung Army favored the use of smaller armored rail trolleys that could be used to patrol rail-lines independently. Besides a few custom-designed rail-trolleys, the Kwangtung Army sponsored the development of the convertible Type 91 So-Mo armored car, which could be used on the road like a conventional armored car, or on rails by removing the tires from its special steel wheels. As many as 1,000 of these were built, and they were widely used throughout the China theater to transport railway engineer crews and to protect the rail-lines. Sometimes, two or more of these vehicles would be linked together to form a small armored train. An even more sophisticated design followed, the Type 95 So-Ki convertible armored trolley, which was essentially a railroad tank. This vehicle was configured as a light tank with a conventional tracked suspension, but underneath it was fitted with a retractable wheel suspension for riding on narrow-gauge rails. A total of 138 were manufactured from 1935 to 1943 and served in China as well as in Burma.

WORLD WAR II

Blitzkrieg armored trains

Among the opening moves during the German attack on Poland on September 1, 1939, were attempts to seize key rail bridges and stations in the Pomerania corridor using armored trains. At 0430hrs, after a Stuka attack,

C

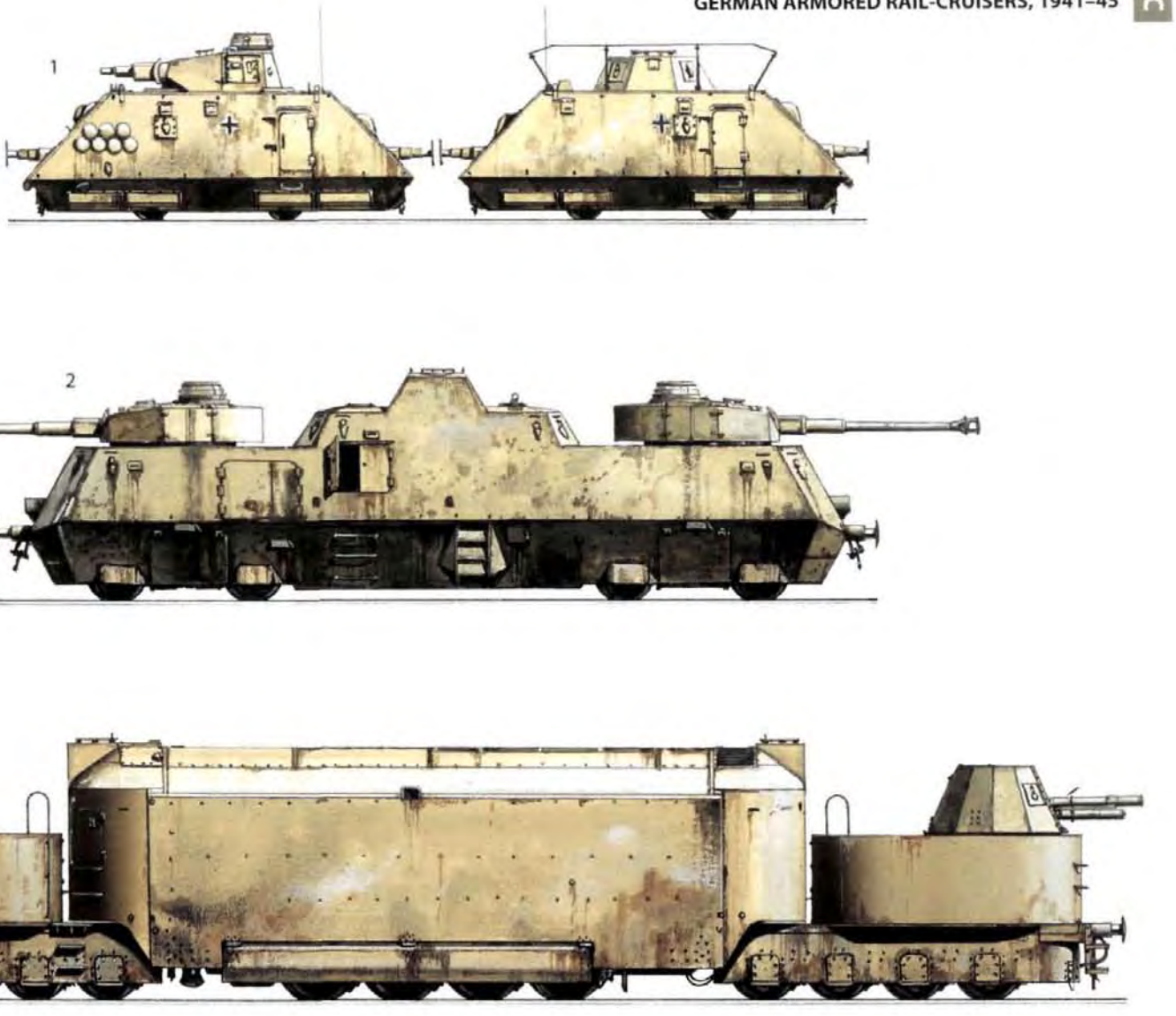
GERMAN ARMORED RAIL-CRUISERS, 1941–45

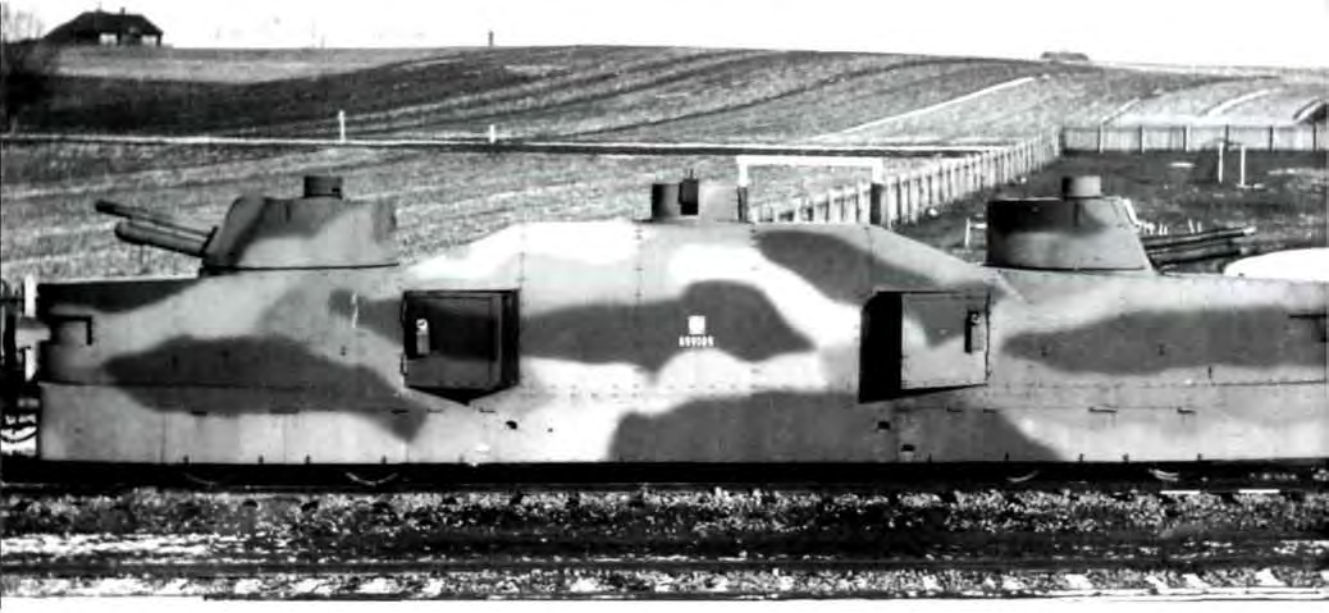
1. Steyr *schweren Schienenpanzerspähzug* (s.Sp.)
2. *Panzerjäger-Treibwagen*
3. *Panzertriebwagen* Nr. 16

Steyr-Daimler-Puch was assigned the task of developing a family of light and heavy armored railway reconnaissance vehicles in the winter of 1943. The *schweren Schienenpanzerspähzug* (heavy armored scout train) shown here came in two basic forms, an *Artilleriewagen* (artillery car) fitted with a surplus turret from older model PzKpfw IV tanks with a short 75mm gun, and a *Kommandowagen* (command car) to carry infantry and the command element of the train; a proposed flak version never entered production. Each *Eisenbahnpanzerzug* (railroad armored train) s.Sp. would have been deployed with 12 of these self-propelled vehicles: two Flak, four artillery, and six command vehicles, plus supporting control wagons and other equipment. These units could operate as a single train, but were intended to be operated independently or in small groups depending on the mission. Sixteen of these units were planned but only six were formed starting in May 1944, numbered 201 (s.Sp.) to 206 (s.Sp.) and became operational from November 1944 to April 1945.

Steyr was also assigned to develop a *Panzerjäger-Treibwagen* (roughly, "tank destroyer car") armored rail-cruiser configured like the Soviet MBV D-2 that had been captured and employed since the summer of 1941. They were armed with two turrets from the PzKpfw IV Ausf H, and production began in December 1944 with five planned, numbered from 51 to 55. Only three were completed, too late for combat deployment.

Panzertriebwagen Nr.16 was a unique design, beginning in 1942 as an armored version of the WR550D14 diesel locomotive. The original SP 42 scheme was to fit special armored cars forward and aft for 20mm Flak 38 antiaircraft cannon. In December 1942 the program shifted to the creation of an armored rail-cruiser fitted with artillery turrets at either end, armed with captured Soviet Putilov 76.2mm Mod. 02/30 field guns. It was deployed in the summer of 1944, supplemented by a pair of *Panzerjägerwagen* on either end with Soviet T-34 turrets on flatcars. It was used for patrols in southwestern Poland through the end of 1944, and finally retreated after the January 1945 Soviet offensive, being captured in the final days of the war by the Soviet Sixty-First Army. It served after the war with the Polish People's Army in antipartisan operations in southeastern Poland and was finally withdrawn from service in the late 1960s.


1
2
3



The most modern Polish armored train designs were completed at the Cegielski plant in Poznan in the 1920s. Some of these were captured by the Wehrmacht and served later on the Russian Front, for example with PZ 10.

the Wehrmacht attempted to sneak several armored assault cars into the Tczew railway station behind the daily civilian transit train. However, the Poles had planted bridge demolitions, and dropped the bridge before the German armored train could reach the station. A similar attack on the Chojnice rail station was spearheaded by an armored train, but was beaten back.

Germany had never been particularly enthusiastic about armored trains. In 1929–37, the Reichsbahn had formed 22 rail security trains for use in the event of civil unrest. These cars and locomotives were protected by improvised armor such as concrete or steel rails, but they were not intended for military action. The Wehrmacht was skeptical of the value of armored trains, and Czech armored trains seized in 1939 were relegated to the reserves. In the summer of 1939, the army changed its mind and decided to form seven armored trains, which were cobbled together using a combination of the security trains and bits of the Czech armored trains.

The Polish Army demobilized most of its armored train force after the Russo-Polish War, keeping only a dozen trains: six on active duty and six in reserve. In 1929–33, all of these trains were modernized. Four trains had all of their equipment replaced with new armored wagons and locomotives, while the remainder were modernized. The standard configuration consisted of an armored locomotive, two artillery wagons, an assault car for the raiding detachment, and a pair of control cars on either end. One of the more interesting innovations in the mid-1930s was the attachment of a larger scout force to each train. Poland purchased six Czechoslovak Tatra T18 armored trolleys, assigning two per train. They were not especially well liked, so instead the Poles developed special carriages for Renault FT light tanks and TKS tankettes to support the train. The carriages could be propelled by the tank's own tracks, or the tanks could disembark to fight away from the rail-line. Each train was assigned a tank detachment that consisted of two TKS carriages and one Renault FT carriage. These could be linked and operate together as a mini-armored train, or be deployed separately. Although they could be used for scouting, their main role was to reinforce the landing detachment of the train.

At the outbreak of the war in 1939, the Polish Army had two armored train battalions, each with five armored trains and supporting vehicles. They saw extensive combat use in the 1939 campaign, typically assigned to provide

fire support for infantry divisions or cavalry brigades. They proved to be surprisingly effective in several encounters with German Panzer units, mainly due to their heavy firepower. Their principal vulnerability was to air attack and of the five armored trains of the 1st Armored Train Battalion, three were lost to Luftwaffe attack, one was demolished by its crew rather than surrender it, and the fifth was surrendered at the end of the campaign. The 2nd Armored Train Battalion fought in southern Poland and ended the campaign in the southeast facing the Red Army. It was not as widely engaged from the air and most of its armored trains were surrendered or demolished by their crews. The Red Army deployed six armored trains during their invasion of Poland after September 17, 1939, split between the 1st Armored Train Battalion with the Ukrainian front, and the 8th Armored Train Battalion with the Byelorussian front. These same two units also took part in the war against Finland in 1939–40. Both the Wehrmacht and Red Army recovered a few Polish armored trains and used them later in the war.

The Wehrmacht again attempted to use armored trains briefly in the 1940 campaign to seize objectives in the Netherlands, but of the ten German armored train operations in Poland and the Netherlands in 1939–40, only two were marginally successful. Two more armored trains were authorized in the summer of 1940, re-using captured Polish and Czech components. Neither France nor Britain made any use of armored trains in the 1940 campaign, though Britain began to form armored trains for coastal defense in the summer of 1940 due to the threat of German invasion after the fall of France.

Russian developments, 1922–41

At the end of the Russian Civil War in 1922, the Red Army had 123 armored trains in service. In the 1920s, most were demobilized and attempts were made to standardize the best of the remaining. Three types were recognized: the basic Type A field assault train, typically armed with four 76mm guns on two artillery wagons plus 15–20 machine guns; the Type B heavy armored train armed with larger-caliber 107–122mm guns and intended for fire support; and the Type V special-purpose artillery armored trains, armed with

Warplanes posed a growing threat to armored trains in World War II. This is the wreck of the PP 13 *Gen. Sosnkowski*, hit by Stukas near Lochow station on September 10, 1939. It was originally built in November 1920 at the Cegielski plant in Poznan in November 1920, but saw no fighting in the Russo-Polish War. It was substantially modernized in the 1930s, though still retaining the older appearance of the 1920 train.

heavy weapons in the 152–203mm range. The armored train force shrank substantially during the interwar years, and there was considerable debate over whether the trains belonged in the expanding armored force or were better suited to the artillery branch. By 1931, the force had been reduced to only 21 armored trains with 14 more in reserve. The most active were the two armored trains of the Special Far East Army, which were kept busy through much of the early 1930s due to the tensions in the region caused by Japanese operations in Manchuria and along the Mongolian border.

As in the case of Poland, the Soviet armored trains underwent modernization and standardization in the 1930s. The Krasniy Profintern Plant and the associated Military Depot No.60 in Bryansk were the main centers for Soviet armored train modernization and production. New standardized light and heavy artillery wagons were manufactured and total production of the new armored train components at Bryansk in 1933–41 was 20 armored locomotives, 69 light artillery wagons, ten heavy artillery wagons, and 27 antiaircraft wagons.

One of the more curious innovations during the late 1930s was the development of the ZhDT-3 railroad torpedo at the Ordzhonikidze Machine Plant in Podolsk. During the civil war, one tactic to eliminate particularly dangerous enemy armored trains was to create a demolition train by taking an expendable locomotive and flatcar, packing the flatcar with explosives, and sending the train down the rail-line at high speed to collide with the enemy armored train. The railroad torpedo was intended to be less wasteful of railway equipment. It consisted of a small, two-axle, battery-powered trolley armed with a 495lb bomb containing a 220lb high-explosive charge. The ZhDT-3 had a top speed of 37mph and a range of about 6 miles. Production started in 1938, and it was planned to equip each armored train with five of these devices. While many of these were in service in 1941 at the outset of the war, there is no record of their actual use in combat, probably due to the lack of suitable targets. As in the Polish case, the Red Army also developed a variety of armored scout vehicles to accompany each armored train. These were simple adaptations of existing armored cars. The BA-20ZhD (Armored Car-20/Rail Carriage) light railroad armored car and BA-10ZhD medium railroad armored car simply consisted of the normal

ARMORED RAIL-TROLLEYS

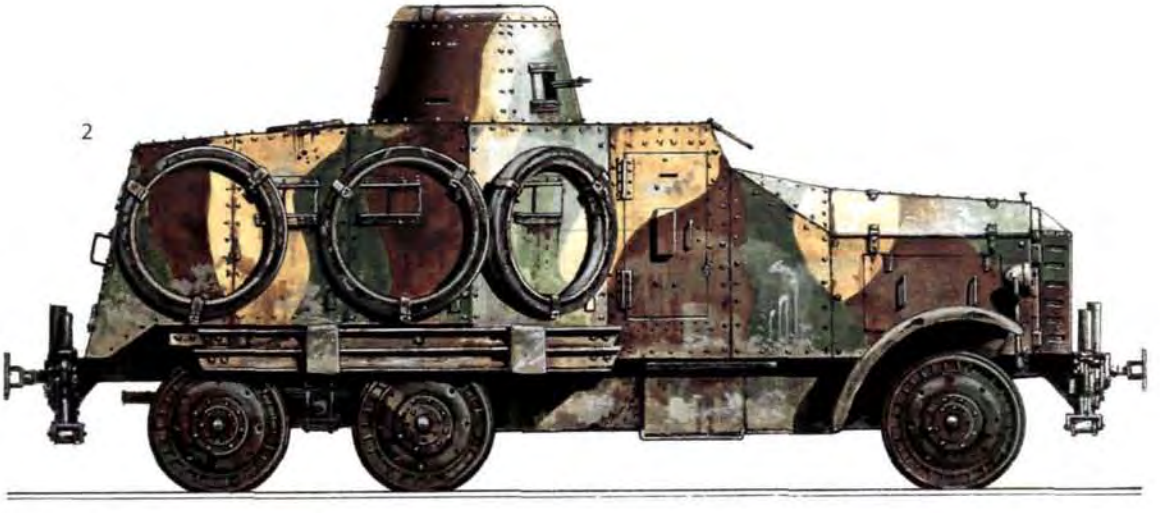
1. Tatra T18, Czechoslovak Army, 1938
2. Type 91 So-Mo Convertible Armored Car, Japanese Kwantung Army, China, 1935
3. TKS Tankette Railway Carriage, Polish Army, 1939

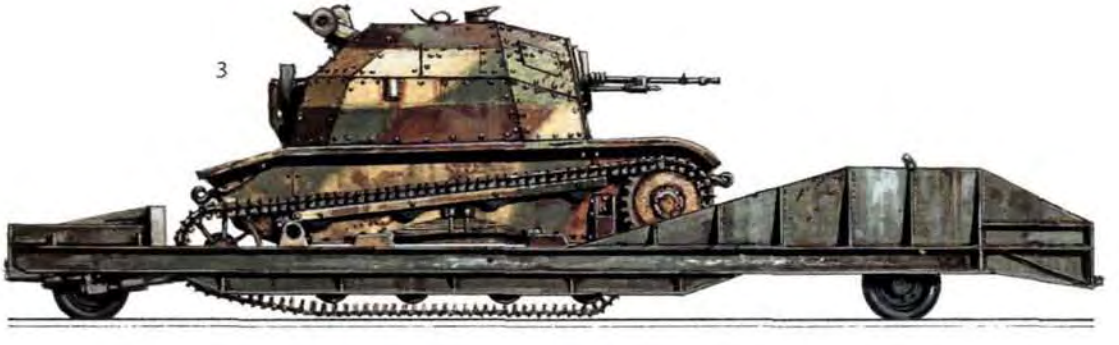
The Polish Army ordered six Tatra T18 armored trolleys in 1926 to support their armored trains as reconnaissance vehicles, and a single example was ordered by the Czechoslovak armored battalion at Milovice, as shown here in its typical 1930s five-color camouflage scheme. This particular vehicle was later seized by the Germans, serving with PZ 1, and a captured Polish T18 was used with PZ 7.

The Type 91 So-Mo could be operated as either an armored car on roads, or as seen here as an armored trolley on rails. When in use on rails, the rubber tires were stowed on the hull side. The example here is seen in typical mid-1930s China-theater camouflage.

Owing to dissatisfaction with the Tatra T18, the Polish Army came up with a more novel solution for armored train reconnaissance, a special carriage for carrying its TKS tankettes. The example here is in the standard Polish late 1930s camouflage scheme of sand gray, dark brown, and dark olive green.

D ARMORED RAIL TROLLEYS



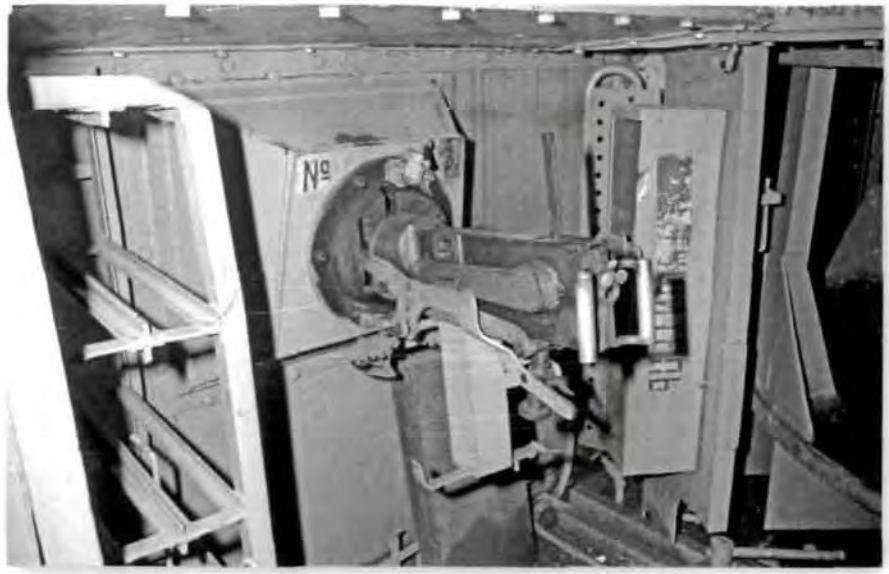


ABOVE
The Krasniy Profintern Plant in Bryansk became the center of Soviet armored train construction in the 1930s, and this is one of the first standardized artillery-car designs from the plant, the PL-35. This particular car was modernized to PL-37 standards with the 76.2mm Mod. 02/30 gun. It served with an NKVD Border Guard unit, was captured near Petrozavodovsk in 1941 by the Finnish Army, and currently is preserved at the Parola Tank Museum.

ABOVE RIGHT
This interior view of the PL-35/37 artillery car at Parola provides an interesting view of the interior. The photo was taken near the center of the car near the observation cupola, with the gun turret evident at the end of the aisle. There are numerous racks for stowing ammunition on either side.

armored car but with special steel wheels for operating on railroad tracks. Each armored train was assigned two light and three medium armored railroad cars, plus a single SU armored trolley.

Besides the Red Army armored trains, the Narodny Komissariat Vnutrennikh Del (NKVD; People's Commissariat for Internal Affairs) state police had their own armored trains for internal security and border patrol missions. Owing to their different roles, the NKVD preferred armored rail-cruisers akin to the Zaamurets. In 1929, the NKVD commissioned the conversion of a Dyrenkov passenger automotrice into an armored rail-cruiser designated as the MBV D-2 (MBV: Motorizovanno-Bronirovanniy Vagon: motorized armored wagon). It was powered by a Hercules UXS 93hp gasoline engine and was fitted with turreted 76.2mm Mod. 02/30 field guns on either end. After trials, 60 of the MBV D-2s were ordered from four plants, though it would appear than only about 40 were completed in 1932–35. These were deployed in seven NKVD regiments, each based around a single armored train which consisted of three MBVs plus an armored or unarmored locomotive and supporting cars. Although the train



The PL-35 was amply provided with machine-gun positions armed with 7.62mm Maxim machine guns in socket mounts. The racks nearby are for additional ammunition stowage.

would ordinarily deploy as a whole, the individual rail-cruisers could be dispatched on separate missions. The Red Army found this concept very interesting and in 1935 ordered the Kirov Plant in Leningrad to develop a somewhat larger design called the MBV-2. This was armed with three T-28 tank turrets, two at the front and one at the rear, and a quad Maxim antiaircraft machine-gun mount was fitted to a retractable platform in the roof. Trials of the MBV-2 pilot began in March 1939 and two were completed before the outbreak of the war with Germany in 1941.

At the time of the German invasion on June 22, 1941, the Red Army armored train force consisted of nine armored train battalions and seven independent armored trains totaling 26 light armored trains and 11 heavy armored trains; the components included 47 armored locomotives, 85 light wagons, and 27 heavy artillery wagons. Each battalion generally consisted of two light armored trains and one heavy armored train. The NKVD had a further 25 armored locomotives and 32 artillery wagons plus the MBV D-2 vehicles mentioned earlier. These were deployed in railroad security divisions for patrolling, not frontline combat.

Soviet armored trains, 1941–45

The Soviet armored trains were extensively used in the border battles of the summer of 1941 and suffered severe losses. German sources suggest that at least 47 armored trains were captured or destroyed as well as seven of the nine NKVD MBV D-2 rail-cruisers deployed in this theater. Portions of these trains were captured intact or slightly damaged by the Wehrmacht and would later be instrumental in building up the German armored train force. Soviet losses were so heavy that a special building program was initiated in October 1941. By November, the armored train force had been reduced to only six battalions from its peak strength of ten battalions in the summer. In November 1941 the State Defense Committee authorized the creation of 40 new battalions.

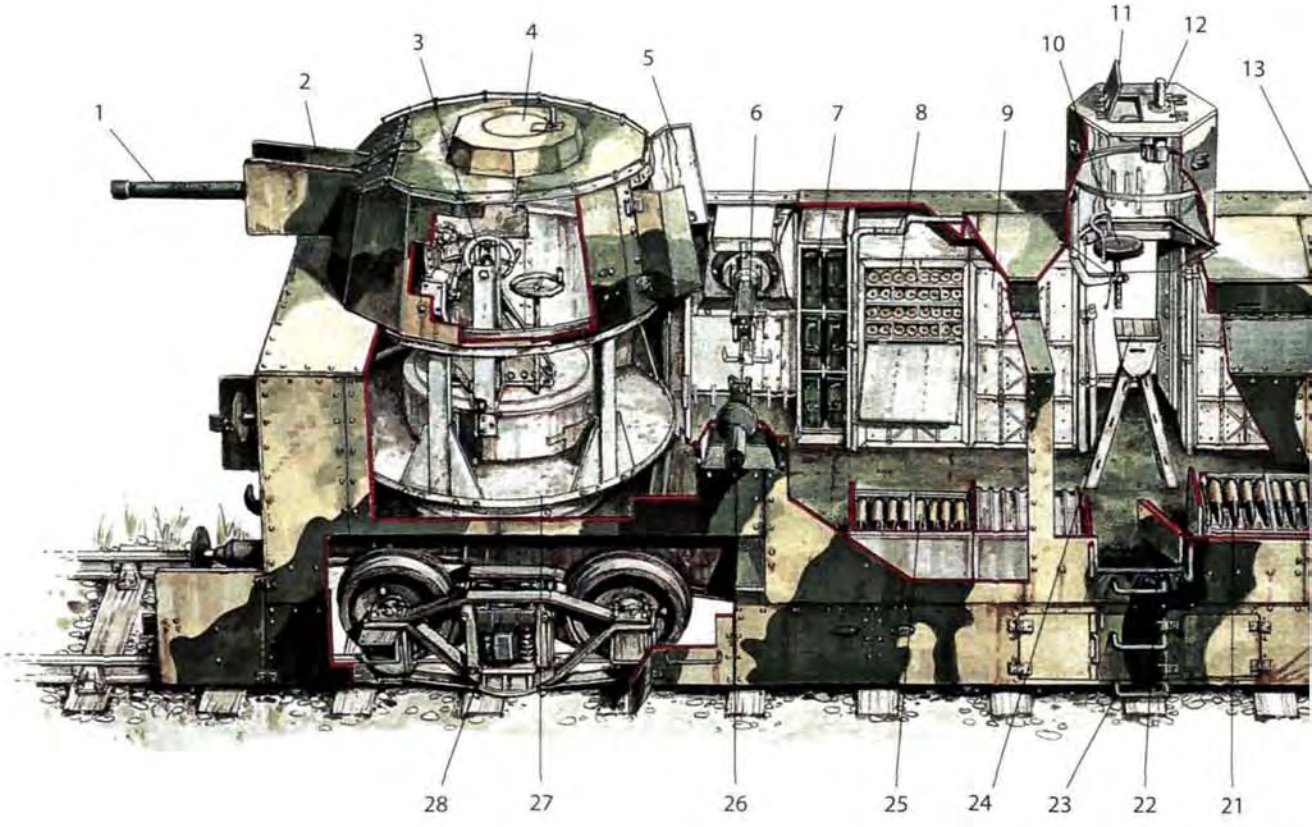
In August 1941, the Narodniy Komissariat Putey Soobshcheniya (NKPS; People's Commissariat of Communications) ordered the construction of at least 52 new armored trains called the Type NKPS-1942. These were

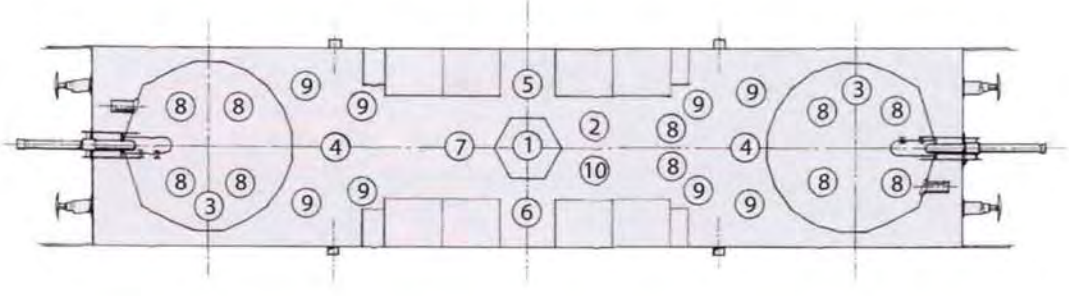
The most powerful of the pre-war armored rail-cruisers was the massive MBV-2 type built at the Kirov Plant in Leningrad. Two were completed in 1938, and the second one, named *Stremitelniy*, served on the Leningrad front as part of the 14th Independent Armored Train Battalion of the 23rd Army. In 1943, its T-28 turrets were rearmed with the longer F-34 76mm gun from T-34 tanks in place of the original short 76mm guns. It was finally retired in 1972 to the Kubinka Tank Museum, as seen here.

E SOVIET PL-37 ARTILLERY WAGON, ARMORED TRAIN NO.2 ZA *RODINU*

12TH ARMY, SOUTHERN FRONT, OCTOBER 1941

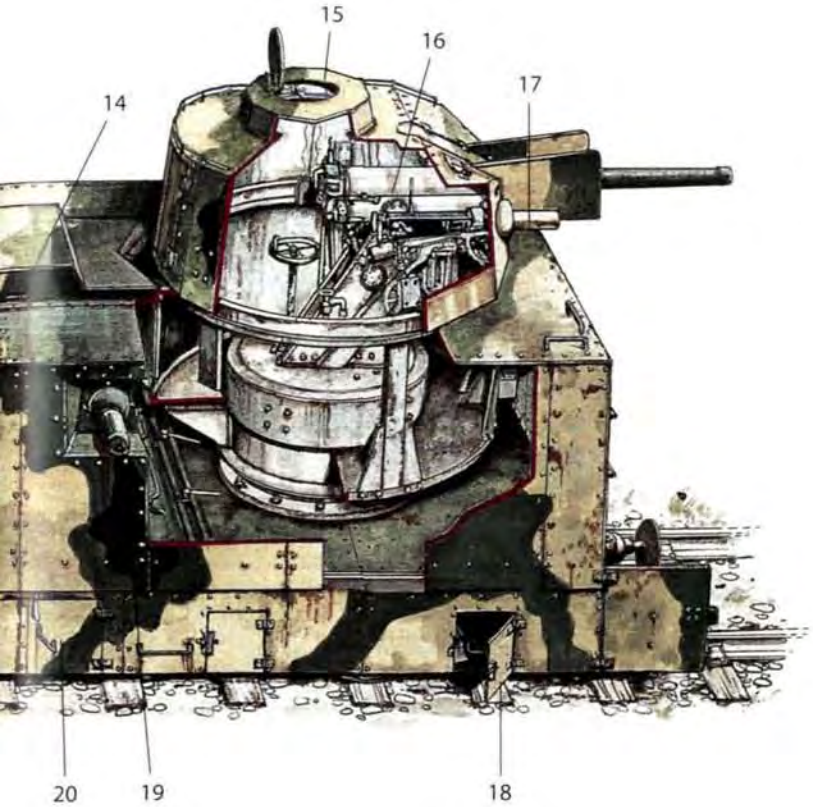
The PL-37 was the standardized light artillery wagon for Soviet light armored trains in the first years of World War II, with about two dozen built. It followed the same pattern as the earlier PL-35 with modest changes in the construction of the turret and superstructure. Although the wagon was fairly large, it had very little free space inside due to extensive ammunition stowage. Owing to its vulnerability to air attack, camouflage painting was commonplace, though the style depended on the unit, in this case a pattern of black and sand over the usual 4BO olive green.





TECHNICAL DATA

Designation	Legkaya broneploshadka PL-37 (light armored platform PL-37)
Manufacturer	Krasniy Profintern Plant, Bryansk
Production	1939–41
Crew	30
Combat weight	77 tons
Length	48ft 2in.
Width	9ft 9in.
Height	14ft 5in.
Chassis	55-ton wagon on Diamond two-axle trucks
Main armament	Two 76.2mm Mod. 1902/30 field guns
Machine guns	Six Maxim 7.62mm water-cooled machine guns
Ammunition	560 76.2mm; 30,000 7.62mm
Armor	0.78-in. sides; 0.59-in. roof
Observation	*Triplex glass visors; one PTK panoramic* periscope for commander



KEY

1 76.2mm Mod. 1902/30 gun (rear turret)
2 Turret embrasure armored protective collars
3 Rear turret gun elevation wheel
4 Rear turret commander's cupola
5 Gun maintenance access hatch
6 Maxim 7.62mm machine gun
7 7.62mm ammunition boxes stowage for Maxim machine gun
8 76.2mm gun ammunition stowage bin
9 Additional 76.2mm gun ammunition
10 Armored artillery car commander's seat
11 Armored artillery car commander's cupola hatch
12 PTK panoramic periscope for armored artillery car commander
13 Armored roof ventilation hatch
14 Crew view slit
15 Cupola for gun commander of forward gun turret
16 Putilov 76.2mm Mod. 1902/30 gun (forward turret)
17 Armored sleeve and ball mount for forward turret's Maxim 7.62mm machine gun
18 Access hatch for wheel lubrication
19 Armored sleeve and ball mount for hull-mounted Maxim 7.62mm machine gun
20 Undercarriage maintenance access door
21 76.2mm gun ammunition stowage
22 Main armored crew entrance door
23 Ladder for crew entry
24 Step ladder for armored artillery car commander
25 76.2mm gun ammunition stowage
26 Rear right side Maxim 7.62mm machine gun
27 Turret floor for gun loaders
28 Rear Diamond two-axle railway trucks

INSET KEY

1 Commander
2 Commander's aide
3 Turret commander
4 Commander of independent machine gun
5 Scout/demolitions
6 Conductor
7 Senior medic
8 Turret crew
9 Machine-gun crew
10 Communications commander

The NKVD Border Guards operated their own armored trains, some based on the MBV D-2 armored rail-cruiser, like the heavily camouflaged example seen here in action in August 1941.

designed at the Poltava yards and about 20 were built using the limited resources at hand. About 40 new trains were built in the summer and autumn of 1941 at various plants and railyards, often using tank components to simplify their construction. Owing to shortages of the larger two-bogie, four-axle flatcars needed for large artillery wagons, a second simplified type was developed, the OB-3 (Oblegechennaya Variant 3: Simplified Variant-3), popularly called the Tretiy (Third). These used small two-axle flatcars with a single turret. They proved to be easier to manufacture than the prewar types, and the turret was designed to accept a wide range of armament in the 75–76mm class. Production was undertaken at nine different plants and 43 scattered rail depots, with the first seven being completed by the end of 1941. Generally, each OB-3 light armored train would receive four artillery cars rather than two of the prewar twin-turret types. By November 1942, some 78 new trains of the NKPS-1942 and OB-3 classes had been completed.

The final standardized armored train design of the war entered development in the spring of 1942 as the BP-43. This simplified light armored train was equipped with four of the new PL-43 artillery cars, each consisting of a T-34 turret on an armored box fitted to a two-axle flatcar. Owing to the importance of air defense, each train also had two PVO-4 (PVO: *Protivo-Vozdushnaya Oborona*: antiaircraft defense) wagons, fitted with two armored boxes each containing a standard 37mm antiaircraft gun. The armored locomotive was usually the PR-43 based on the widely used O series, either the Ov or Ok. A total of 21 of these trains were built, starting in late 1942: two were completed in 1942, 18 in 1943 and one in 1944. The new construction permitted the steady expansion of the armored train battalions: 40 by January 1942 and 67 battalions at their peak in August 1942. Each battalion generally had two armored trains instead of the three found in prewar battalions, because of lingering shortages. By the end of 1942, the Soviet armored train force stabilized at 61 battalions with about 41 on active duty at the front and the rest in reserve. The force would remain at this level through most of the war, only decreasing to 52 battalions in the final months of the fighting.

Although Soviet armored trains were used throughout the war, their tactical value decreased due to their vulnerability to air attack and the greater versatility of tanks and self-propelled artillery. The major area of growth for Soviet armored trains was in the air defense role. PVO trains had been developed in the 1930s such as the SPU-BP armored wagons, but only 27 were built up to 1941. Railroads were absolutely essential in supplying frontline Red Army units, and while fixed antiaircraft guns were adequate for site defense, they were not especially useful for railroad defense. An expansion of the PVO armored trains began in the autumn of 1941 and continued through the end of the war. These trains were quite varied in composition, covering the gamut of antiaircraft weapons from the popular

Many Soviet armored trains were lost in the 1941 summer battles. This is a heavy armored train with the photo taken from the command car, the radio aerials evident in the foreground. The heavy artillery car in front is a Military Depot 60 type built in 1931–32 with the characteristic single turret. (NARA)

The heavy armored train losses in the summer of 1941 led to a crash program in October 1941 to build the simplified OB-3 light armored train as seen here. The OB-3 had four single-turret artillery cars, propelled by an armored version of the Ov locomotive.

Maxim quad 7.62mm machine-gun mount through the 85mm antiaircraft gun. By the end of 1942, there were 21 PVO air defense trains in operation, rising to 69 at the end of 1943, 93 by the end of 1944, and 84 at the time of the war's end in May 1945. While these were used primarily behind the lines, some antiaircraft trains were detached to the army fronts for air defense protection. About 200 PVO armored trains were built during the war.

Wehrmacht armored trains, 1941–45

The poor performance of the early German armored trains in 1939–40 provided little encouragement for their further development in the Wehrmacht. In 1941, the Railroad Engineer Inspectorate 10 proposed the design for future armored trains, but since there was no time actually to put these plans into effect, orders were issued on June 1, 1941, to create six

F

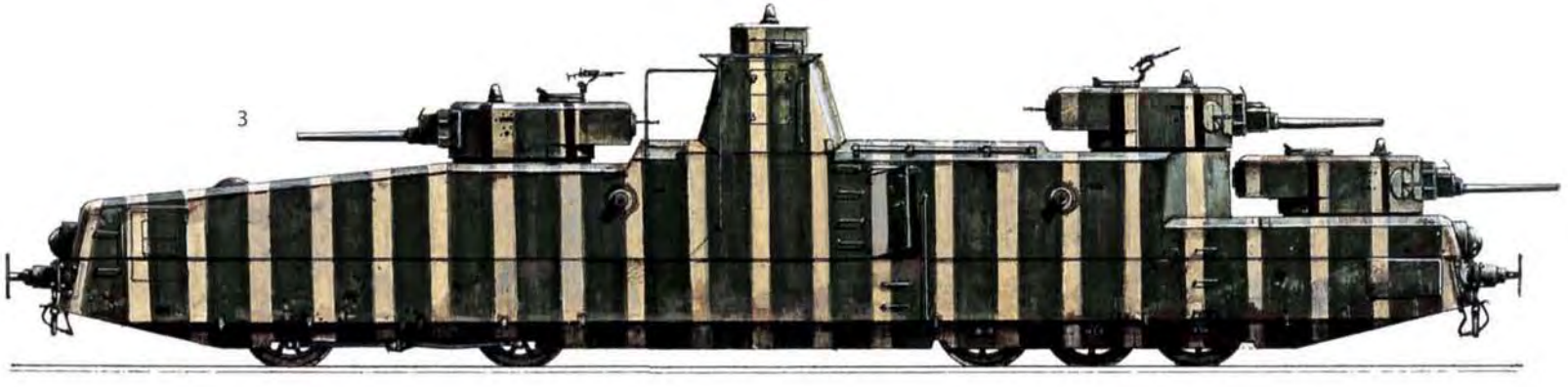
SOVIET ARMORED RAIL-CRUISERS, 1941–45

1. NKVD Armored Rail-Cruiser MBV D-2, Summer 1941
2. Armored Rail-Cruiser *Krasnaya Zvezda*, December 1941
3. Armored Rail-Cruiser MBV-2 *Stremitelniy*, Leningrad front, 1942

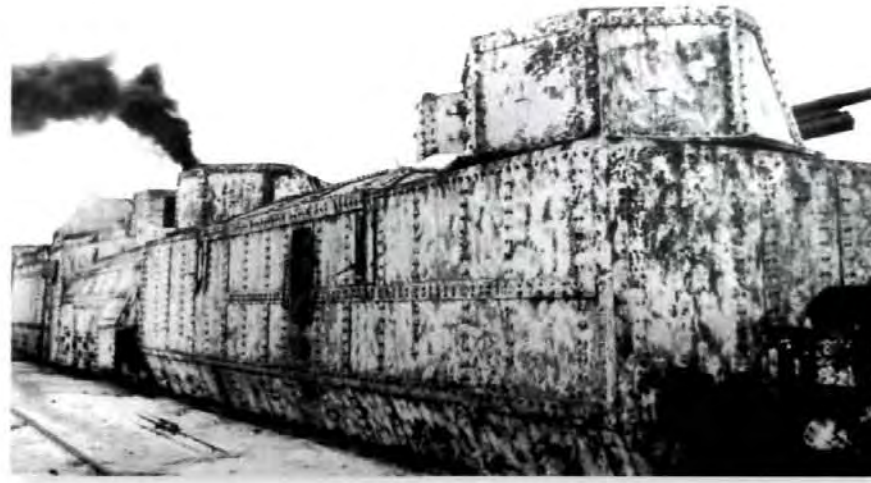
The NKVD MBV D-2s were the standard Soviet armored rail-cruisers at the start of World War II. They were finished in the usual Soviet 4BO dark olive green; a close contemporary match is US FS34130. They were generally not marked beyond some small stenciling. *Krasnaya Zvezda* ("Red Star") is typical of local initiatives in the autumn and winter of 1941–42 with attempts to rebuild the armored train force. This *broneavtomotrissa* (armored *automotrice*, or armored rail-cruiser) was designed at the Kuibyshev Locomotive Plant in Kolomna using the turret and V-2K diesel engine from a KV-1 heavy tank. It is seen here finished in a coat of whitewash over the usual 4BO olive-green finish. *Stremitelniy* ("Impetuous") was the second of two MBV-2 armored rail-cruisers built at the Kirov Plant in Leningrad in 1936–37 using turrets from the T-28 medium tank. In September 1941 it was modernized with new L-11 76mm guns substituted for the older and shorter KT-28 guns. It is seen here in its unusual 1942 scheme, consisting of bands of tan and black over the usual 4BO olive-green finish.

1

2



3



The standard Soviet light armored trains operated two artillery cars, each with two turrets armed with 76mm guns, in this case the old Putilov 76.2mm Mod. 02/30. This train is seen in action in January 1942.

interim broad-gauge armored trains to support Operation *Barbarossa*. Each of the three army groups assigned to the invasion were assigned two trains each. *Panzerzug* (PZ) 26 to PZ 31 were based around a partially armored Series 57 locomotive, three OMMR flatcars with captured French Somua S-35 tanks, and open-top infantry cars.

The primary mission of the German armored trains in the opening phase of the campaign was to seize key rail bridges. Later in the summer, six of the existing armored trains (PZ 1–4, 6–7) were converted to Russian gauge to permit their use in the campaign. Although the Wehrmacht had shown little enthusiasm for armored trains prior to 1941, after the war in Russia bogged down, the need for them became more evident and the German armored train force grew steadily through the course of the war. Railways were vital to supplying the Wehrmacht, and the long stretches of railroad could not be economically defended using fixed defenses. Armored trains were extremely useful for protecting the railroads, as well as for rapidly deploying forces to deal with the ever-increasing partisan threat.

Two Polish armored trains captured by the Red Army in 1939 were recaptured by the Wehrmacht near the frontier, combined and pressed into

The crash building program for armored trains in the winter of 1941–42 frequently used tank turrets to speed up construction, in this case the main gun turret and subsidiary machine-gun turrets from a T-28 medium tank.

This BP-43 light armored train named *Moskva* ("Moscow") is seen in June 1943 during a presentation ceremony by the railway workers of the Moscow district, who donated funds to its construction. The PL-43 artillery car with its T-34 turret is seen in the foreground, while behind it is one of the train's two PVO-4 antiaircraft cars with two 37mm guns.

service as PZ 10. Through most of 1942, local German railway troops adapted captured Soviet armored train equipment to their own needs, in some cases incorporating them into existing armored trains, and in other cases using them to create new armored trains. Improvised armored trains were also constructed in Russia using local resources, and numerous "rail-protection trains" were assembled, which used improvised protection such as sandbags or concrete armor for defense. In the summer of 1942, a more systematic program for rebuilding the older armored trains (PZ 1 to PZ 25) was undertaken, heavily relying on captured Soviet equipment.

The value of armored trains in the "war of the rails" led to the design of more modern equipment. Inspectorate 6 developed the BP 42 design patterned after Polish and Soviet armored trains and armed with two turreted 76.2mm fields guns and two 100mm howitzers. Two of the artillery cars also had platforms for mounting the quad 20mm Flak 38 automatic cannon for antiaircraft defense. These trains also deployed special flatcars for transporting and disembarking *Panzerkampfwagen* (PzKpfw) 38(t) light tanks to carry the fight away from the rails. In addition, the trains were generally accompanied by captured French Panhard 178 armored cars, modified to ride on the rails

PZ 32 was captured on September 8, 1944, in St. Bérain, France, a rare example of a German armored train operating in the West. The front turret is armed with a 100mm I.F.H. 14/19(p) while the front dismount wagon has a self-propelled gun based on the French Lorraine tractor with Soviet 122mm howitzer.

The BP 42 used a new standardized design of artillery car. Each train had two *Art. u. flak-wagen (artillerie und flakwagen)* with a turreted field gun turret such as the 100mm FH 14/19(p) seen here, as well as a flak platform armed with a quad 20mm Flak 38. These went into operation on the Russian Front in 1943.

G STANDARD ARMORED TRAIN CONFIGURATIONS, 1939–65

1. PP No.7 *Piłsudczyk*, Polish Army 1939
2. OB-3 Light Armored Train, Red Army 1942
3. BP-42 Armored Train, Wehrmacht 1943
4. BP-43 Light Armored Train, Red Army 1943
5. BP-44 Armored Train, Wehrmacht 1944
6. Zaibaikal Tank Train, Soviet Army, 1965

Piłsudczyk is typical of Polish armored trains in the 1939 campaign, with two artillery cars, a single command/assault car, and an armored Ti3 locomotive. These trains typically had a supporting tank detachment with a mixture of TKS and Renault FT tanks mounted on special self-propelled carriages. Both the tanks and trains were in the usual Polish Army camouflage of sand gray, dark brown and dark olive green.

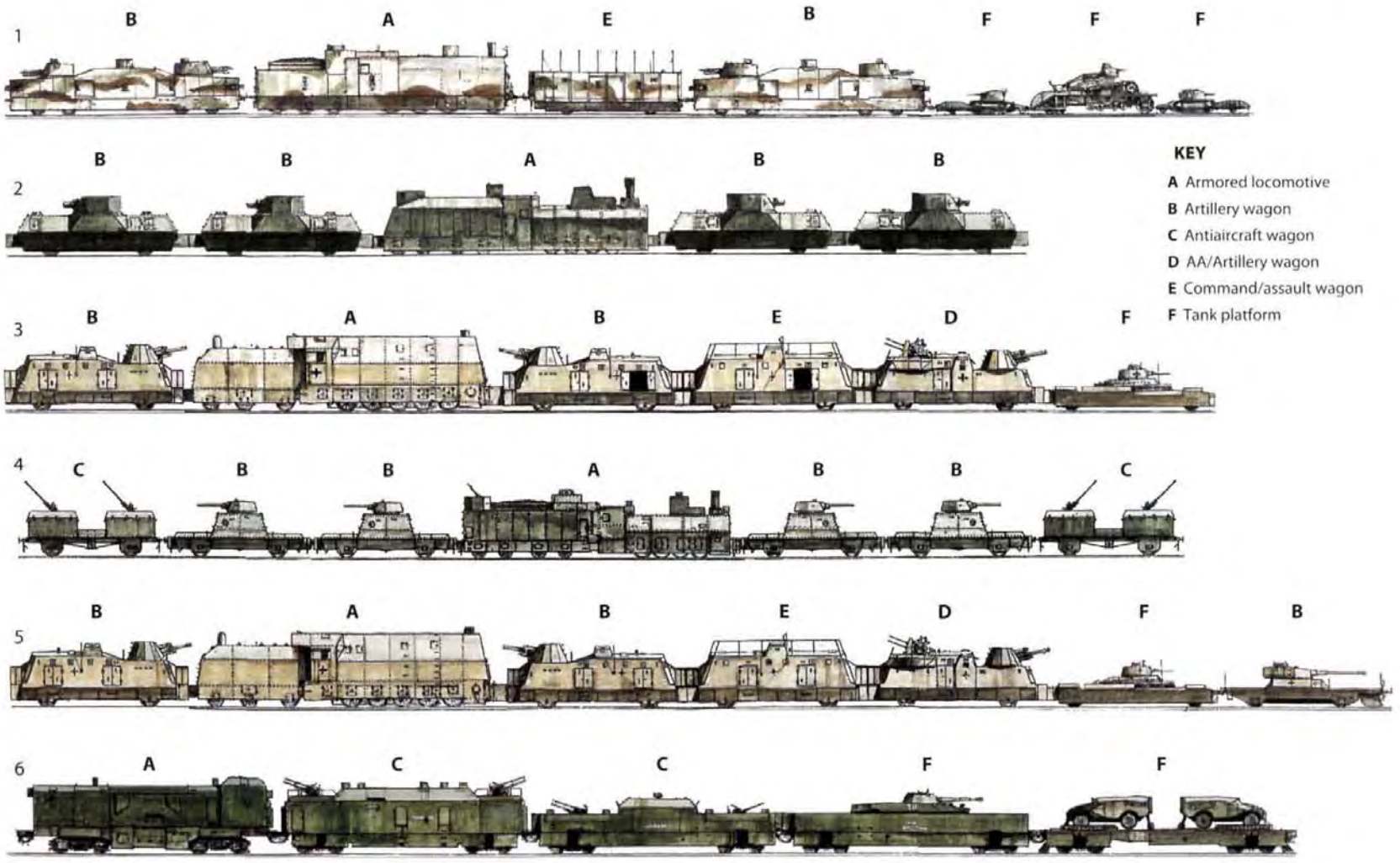
The OB-3 light armored train was an attempt by the Red Army to reconstitute the armored train force quickly and inexpensively after the severe losses of 1941. The artillery cars are on simple two-axle wagons with only a single turret. Several control cars would be fitted to either end, not shown here for reasons of space.

The BP-42 was the first standardized armored train in the Wehrmacht in World War II. The illustration here is truncated due to space issues, as the train would include an additional command wagon, flak/artillery wagon, and Panzer dismount wagon behind the aft artillery car.

The BP-43 was another attempt by the Red Army to flesh out its armored train force in an expeditious fashion, using T-34 tank turrets on the artillery cars. In comparison to the OB-3 train, the BP-43 introduced more antiaircraft protection in the form of two cars, each armed with two 37mm automatic cannon. Control cars would usually be fitted forward and aft.

The BP-44 was a further elaboration of the BP-42 with the main change being the addition of the new *Panzerjägerwagen* at either end of the train for tank defense. As in the case of the BP-42 illustration, this one is truncated to the left and the full train would include an additional command wagon, flak/artillery wagon, *Panzerjägerwagen*, and Panzer dismount wagon behind the aft artillery car.

In the mid-1960s, the Transbaikal Military District formed several armored trains, dubbed "tank trains," to help patrol the disputed frontier with China. The train was intended to deliver tanks and other mobile vehicles such as the convertible BTR-40 (ZhD) where needed, and the base train was amply protected with antiaircraft guns in the form of four ZPU-4 quad 14.5mm heavy machine guns and one ZU-23 twin 23mm gun; these could also be used in the direct-fire mode against infantry. The train here is a bit truncated and would contain another tank platform. These trains were usually supported by a "flying party" consisting of a separate train with a T-62 on a dismount wagon propelled by a smaller armored locomotive.


1
B A E B F F F
2
B B A B B
3
B A B E D F
4
C B B A B B C
5
B A B E D F B
6
A C C F F
KEY
A Armored locomotive
B Artillery wagon
C Antiaircraft wagon
D AA/Artillery wagon
E Command/assault wagon
F Tank platform

The Wehrmacht used a variety of types of armored cars for rail scouting with their tires removed and replaced by steel wheels. This captured French *Panzerspähwagen* (Fu) Panhard 178-P204(f), with a large frame antenna added for its radio, was one of 47 converted for railway patrolling, and is seen here after its capture by the Red Army in 1944.

as scouts. The first of the new BP 42 armored trains, PZ 61, was deployed in December 1942, and a total of 12 were built through February 1944. The later BP 44 improved the armament with the use of four heavier 100mm or 105mm turrets and added a tank-destroyer car based on a PzKpfw IV Ausf H turret. The *Panzerjägerwagen* (tank hunter vehicle) was used at the front and rear of the train to provide antitank capability as well as direct artillery support. The first of the BP 44 trains, PZ 73, was deployed in June 1944, and nine were completed through the spring of 1945. German armored train strength remained significantly lower than Soviet strength, only 21 by 1942, 29 by 1943, 45 by 1944, and 55 by 1945.

Panzertriebwagen 16 was a unique armored rail-cruiser based around an armored WR 550 D14 diesel locomotive with two turrets armed with 76.2mm guns on connected cars on either end. After its capture in 1945, it was used by the Polish Army as the *Lokomotor* during the fighting against the Ukrainian UPA partisans in the late 1940s, and was formally retired to the Warsaw Railroad Museum in 1974.

The first Wehrmacht *Panzertriebwagen* (armored railroad cruiser) was PT 15, which was attached to PZ 25. Since PT 15 had low priority, the Germans instead rebuilt seven captured Soviet MBV D-2 rail-cruisers with new motors and other improvements, and they entered combat starting in December 1943 as PT 17 to PT 23. The most powerful German armored rail-cruiser was the PT 16, which consisted of an armored diesel locomotive with two turrets armed with 76.2mm guns on connected cars on either end. Completed in late 1943, it was first deployed to Poland in the summer of 1944 following the collapse of Army Group Center.

The Wehrmacht generally operated its armored trains independently, but local commanders recommended following the Soviet practice of armored train battalions. The successful use of PZ 2 and PZ 68 at the Berezina River crossing near Shazliki in November 1943 promoted the formation of the first armored train regiments in 1944, each to consist of three battalions with two armored trains each. The plan was to consolidate the armored trains of each army group under these commands for better coordination. Two regimental staffs were formed in the autumn of 1944, but they had little effect due to the catastrophic conditions on the Eastern Front at this time. In total, the Wehrmacht ordered about 70 armored trains during the war, with operational strength peaking at about 55 armored trains in 1945. Most of these operated on the Russian Front or in the Balkans, though a few were captured by US and British forces in 1945 as the fronts collapsed.

Other armored trains in World War II

A number of other armies in World War II deployed armored trains, though not on the scale of the German and Soviet armies. Italy used improvised armored trains for antipartisan operations in Yugoslavia, and Ansaldo-Littorina built five ALn-56 "Littorina Blindate" armored rail-cruisers in two versions, an initial type with two 81mm mortars and an improved type fitted

Paralleling the Soviet case, the Luftwaffe introduced antiaircraft armored trains to help defend railways from strafing Allied fighter-bombers. They used a pair of pre-fabricated reinforced concrete gun pits on each car, and various types of antiaircraft weapon. In this case, the armament consists of the triple 30mm Drilling MG151 in each gun pit. This train was overrun by the US Army near Langenprozelten on the Main River north of Würzburg in early April 1945. (NARA)

The standardized BP 44 design introduced a new *Panzerjägerwagen* at the front and rear of the train using a turret from the PzKpfw IV tank. This is PZ 75, which surrendered in Hagenow station to the US Army in May 1945. (MHI)

with twin 47mm gun tank turrets. The Italian Army regularly used AB 40 and AB 41 armored cars as rail scouts using steel railway wheels instead of tires. As mentioned previously, the British Army deployed over a dozen armored trains for coastal protection during the invasion scare of 1940 and these remained operational on the English coast through 1943.

THE DECLINE OF ARMORED TRAINS

Armored trains were used in a number of conflicts after World War II, but clearly their day had passed. Typically they were used in colonial conflicts or regional wars in remote areas where tanks and other armored vehicles were few in number. The Soviet and Polish armies used armored trains against the Ukrainian UPA partisans in 1945–49. The French Army used armored trains for rail protection in the Indochina conflict of 1947–54, and again in the fighting in Algeria in the 1950s. Britain employed armored trolleys during the Malaysian Emergency, including a dozen custom-built Armoured Wickham trolleys. Improvised armored trains were used during the fighting in the Belgian Congo in 1959–60. During the crisis along the Chinese border in the 1960s, the Soviet Army formed several "tank trains" for patrolling the long border areas. Russian armored trains were used in the fighting in Armenia and Chechnya in the 1990s, and during the Yugoslav civil war of the 1990s improvised armored trains were created by Croatian, Bosnian, and Serbian forces and used in combat. While armored trains no longer have a central place in the tactics of most contemporary armies, they remain a useful weapon for rail security and antipartisan warfare and are likely to reappear when the need arises.

Britain developed armored trains from late June 1940 for coastal defense against a possible German invasion, the trains eventually lettered A through M. Their main armament was a 6pdr Hotchkiss gun in the front of the car, plus the infantry section's rifles. After April 1941, they were manned by Polish troops as seen here.

FURTHER READING

Armored trains have remained one of the less-explored corners of armored vehicle history, though there are numerous articles and scattered books on the subject. The cornerstone for anyone seriously interested in this subject is Paul Malmassari's ground-breaking *Les Train Blindés 1826–1989*, and Edwin Pratt's *The Rise of Rail-Power in War and Conquest* is one of the earliest examinations of the role of railroads in military service and has some excellent material on early armored trains. Given the fascination with German Panzers, it is not surprising that this area of armored train history is particularly well covered, notably Wolfgang Sawodny's superb

Although armored trains faded from service in the Soviet Army after the war, there was still considerable interest in vehicles for rail patrol and air defense. One of the most common types was the BTR-40A (ZhD) convertible railway armored car. It was based on the standard BTR-40A with a ZTPU-2 antiaircraft turret with twin KPV 14.5mm machine guns. Special retractable wheels were fitted at the front and back that could be lowered to permit the vehicle to ride on rails. These conversions were undertaken from 1969, and this type was still in service with the Soviet Army in 1991 at the time of the USSR's dissolution.

Die Panzerzüge des Deutschen Reiches 1904–1945. In spite of their central role in the history of armored trains, Russian and Soviet trains are weakly served; there are a handful of books with mostly anecdotal coverage and scattered articles. The short Kolomiets book mentioned below is a vital step forward and also appeared in a Polish/English edition from Militaria Press in Poland in 2006 as *Tank Power* No.251. The two books on armored vehicles of the Russian Civil War in the Osprey New Vanguard series are a useful introduction to this fascinating subject. Sadly, one of the premier armored train researchers, Janusz Magnuski, died before his two major works on Soviet and Polish armored trains were published. The G. Balfour book listed here is a very good treatment of Britain's armored train development. The articles listed below are but a small sampling of the vast amount of scattered literature on this subject and focus on particularly useful or important pieces. For example, the Markovskiy article is the only detailed article on post-World War II Soviet armored trains.

During the 1970s and 1980s, a circle of armored train enthusiasts, including Janusz Magnuski, Just Probst, Ivan Bajtos, James Loop, and others exchanged some self-published monographs on armored trains of the Czech Legion, Lithuania, Estonia, Latvia, Finland, Ukraine, Hungary, China, and others. I was lucky enough to share in this project and some of this research is reflected in this short book. There are some notable collections of reference material scattered about in the world's archives. I found the records of the US Army Military Intelligence Division from the 1920s and 1930s in the US National Archives to be particularly fascinating, as there are extensive accounts from military attachés about armored trains in the Russian Civil War, and some especially rich material on Chinese armored trains.

Articles

Barrows, Maj. Gen. David, "Russian Armored Railway Cars," *The Cavalry Journal*, Vol.38, No.155 (April 1929) pp.161–69

Baryatinskiy, M., "Supertank on Rails: the MBV-2,"* *Modelist-Konstruktor*, No.9 (1998) pp.37–40

Kolomiets, Maksim, "*Zaamurets* Armored Motor Wagon,"* *Tekhnika i vooruzhenie*, No.7–8 (1992) pp.7–9

_____, "Khunkhuz – The First Armored Train,"* *Modelist-Konstruktor*, No.8 (1994) pp.25–28

_____, "The 'Three' Marches to Battle: The OB-3 Armored Train,"* *Modelist-Konstruktor*, No.5 (1995) pp.21–24

_____, "Heavy Armored Train *Krasnaya Zvezda*,"* *Tankomaster*, No.4 (1997) pp.32–34

Krylov, Yevgeniy, "Military, Special, Armored: Armored Train *Kozma Minin*,"* *Modelist-Konstruktor*, No.5 (1980) pp.4–9

Kudlicka, Bohumir, "*Orlik*: Armored Train of the Czechoslovak Legion in Russia," *Tankograd Gazette*, No.15 (2001) pp.27–30

Lebedinskaya, Olga, "The Khunkhuz Armored Train,"* *Tankomaster*, No.2 (1997) pp.14–17

Magnuski, Janusz, and Steven Zaloga, "Polish Armoured vehicles of W.W.2: Armored Train *Piłsudski*," *Military Modelling* (October 1983) pp.730–33; (November 1983) pp.843–45

_____, "Drezyna Pancerna SOK," *Militaria*, Vol.1, No.1 (June 1991) pp.37–39

_____, "Pociag Pancerny BP-43," *Nowa Wojskowa Technika*, No.10 (1994), pp.3–8

_____, "Pancerne Wagony Motorowe NKWD," *Nowa Wojskowa Technika*, No.9 (1996) pp.12–18
Markovskiy, Viktor, "Our Armored Train,"* *M-Khobbi*, No.4 (2002) pp.16–21
Romadin, Sergey, "The Fate of the Zheleznakov,"* *Tankomaster* No.1 (1998) pp.17–22
Svirin, Mikhail, "Russian Armored trains of the Great War,"* *Poligon*, No.1 (1) (Winter 2000) pp.42–47
Zaloga, Steven, "Polish Armored Trains in 1939," *AFV News*, Vol.12, No.3 (May 1977) pp.6–10
_____, "Armour in China," *Military Modelling Annual* (1983) pp.4–9

Books

Alexander, Edwin, *Civil War Railroads & Models* (Clarskon Potter, 1977)
Amirdzhanov, A. R., *From Armored Trains to Rail-mobile Missile Systems** (RVSN: 1995)
Balfour, G., *The Armoured Train: Its Development and Usage* (Batsford, 1981)
Caiti, Pierangelo, *Artigliere ferroviare e treni blindati* (E. Albertelli, 1974)
Bullock, David, *Armored Units of the Russian Civil War: White and Allied* (Osprey, 2003)
_____, and Alexander Deryabin, *Armored Units of the Russian Civil War: Red Army* (Osprey, 2006)
Drogovoz, Igor, *Fortresses on Rails: The History of Armored Trains** (Kharvest, 2002)
Gawrych, Wojciech, *German Armored Train Panzer Triebwagen Nr.16* (Progress, 2003)
Hauptner, R., and P. Jung, *Stahl und Eisen im Feuer: Panzerzuge und Panzerautos des K.U.K. Heeres 1914–1918* (Stohr: 2003)
Kolomietz, Maksim, *Armored Trains of the Red Army 1930–1941** (Frontovaya Illustratsiya, 2004)
Krasnicka, Urszula (ed.), *Pociagi pancerne 1918–1943: Organizacja-struktura-działania wojenne* (Muzeum Wojska w Białystoku, 1999)
Lášek, Pavel, and Jan Vanek, *Obrnená Drezína Tatra T 18* (Corona, 2002)
Magnuski, Janusz, *Pociag pancerny Danuta* (WMON, 1972)
Magnuski, Janusz, *Pociag pancerny Zygmunt Powstaniec* (WMON, 1981)
Malmassari, Paul, *Les Trains Blindés 1826–1989* (Heimdal, 1989)
Potseluyev, V. A., *Armored Vehicles on the Railways** (Molodaya Gvardiya, 1982)
Pratt, Edwin, *The Rise of Rail-Power in War and Conquest* (Lippincott, 1916)
Sawodny, Wolfgang, *Panzerzüge im Einsatz auf deutscher Seite 1939–1945* (Podzun-Palas, 1989)
Sawodny, Wolfgang, *German Armored Trains in World War II* (Schiffer, 1989)
Sawodny, Wolfgang, *Die Panzerzüge des Deutschen Reiches 1904–1945* (Eisenbahn Kurier, 1996)
Sawodny, Wolfgang, *German Armored Trains on the Russian Front 1941–1944* (Schiffer, 2003)
Trojca, Halina and Waldemar, *Panzerzüge Vol. I & II* (Militaria, 1995)
Yefimov, A. V. *et al.*, *Armored Trains of the Great Patriotic War 1941–45** (Transport, 1992)

* Russian titles translated to English

INDEX

References to illustrations are shown in **bold**.
Plates are shown with page numbers in brackets.

Ablamowicz, Lt. Wlodomierz 21
American Civil War (1861–65) **5**, 5, **6**
Ansaldo-Littorina 43
antiaircraft armored trains, Luftwaffe **43**
antiaircraft defense wagon, Soviet PVO-4 34, **39**
Antwerp, siege of (1914) **8**
armored cars: Italian AB 40 and AB 41: 44; Japanese Type 91 So-Mo **22**, 24, **D2** (28); Panhard 178: 39, 42; *Panzerspähwagen* (Fu) Panhard 178-P204(f) **42**; Red Army scout 28, 30; Soviet BTR-40A(ZhD) **45**
armored personnel carrier, Japanese Type 95 So-Ki **22**, 24
armored train configurations **G** (40)
armored trains, clashes between 16, 18
artillery cars/wagons
  Austro-Hungarian: MAVAG **10**; *Motorkanonwagen* **13**
  German BP 42: 39, **40**, **G3** (40); PZ 61: 42
  German *Omk(u)-Wagen* **11**
  Polish **4**
  Russian Sormovo-pattern **A2** (8)
  Soviet **38**; Military Depot type 60: **35**; PL-35 **30**; PL-37 **E** (32); PL-43 **39**
Austro-Hungarian armored trains **10**, **13**, 11, 20; Pz.Zug I 11; Pz.Zug II 11, **A1** (8); Pz.Zug IX 12
Austro-Hungarian troops 5

Babinrub tunnel 11
balloons, observation 16
Baltimore, Maryland to Havre de Grace line 5
Belgian Army 10
Boer War (1899–1902) **6**, 6–8, **7**
Bolshevik armored trains 14, 18, 20–21; BP (Bronepoyezd) No.1 and No.2: 14; *Krasnoarmiyetz* 20–21; *Vtoroy Sibirskiy* (2nd Siberian) **13**
Bolshevik Black Sea Fleet 18
Bolsheviks 14 *see also* Red Army
Botha, Gen. Louis 7
Brest-Litovsk, Treaty of (1918) 14, 21
British Army: coastal defense armored trains 27, **44**, **45**; Royal Dublin Fusiliers, 2nd **6**, 7; Royal Engineers 6; *see also* Royal Navy; Royal Marines
Bryansk, Military Depot No.60: 28
Bryansk Machine Plant 14

Cape Government Railways 6–7
Cegielski Plant, Poznan **4**, **26**, **27**
Chinese armored trains 21–24; *Chung Shan* 22–23; *Great Wall* 22; *Hupeh* **20**, 22–23; *Shan-tung* **21**; *Yangtze River* 22
Chinese army, 4th Armored Train Battalion **21**
Chinese National Revolutionary Army 22–23
Churchill, Winston S. **6**, 7
Compagnie d'Orleans 5
Confederate Army 5
Czech Army armored rail-trolleys **D1** (28)
Czech Legion **12**, **15**, **B2** (16), 18–19

decline of armored trains 44

Egyptian campaign (1882) 6

Franco-Prussian War (1870–71) 5
French armored trains 44

German armored trains 10, 11, 24, 26, 27; 1941–45 36, 38–39, **G3** (40), 42–43; BP-44 **G5** (40), 42, **44**; Luftwaffe antiaircraft **43**; PZ V **11**; PZ 1: **10**; PZ 2: **10**, 43; PZ 4: **23**; PZ 10: 38–39; PZ 26 to PZ 31: 38; PZ 32: **39**; PZ 68: 43; PZ 73: 42; Pz.Zug I and II 11; German Army (Wehrmacht) 11, 14, 21; armored train regiments 43

Hooker, Gen. 5
Hungarian Railways (MÁV) **A1** (8), **13**, 11

Italian armored trains 43–44

Japanese Kwantung armored trains: *Rinji Soko Ressha* 23; Type 94: 23
Japanese Kwantung Army **B3** (16), 19, 21, **22**, 23–24, **D2** (28)

Kolobov, Gen. Maj. Mikhail 12–13
Koluszki station 11
Krasniy Profintern Plant, Bryansk 28, **30**

Lee, Gen. Robert E. 5
locomotives: Austro-Hungarian MÁV 377 **A1** (8); German Series 57: 38; *Ov Ovechkoi* **A2** (8); Polish Ti3 **G1** (40); Russian Ov **A2**, **A3** (8); Soviet PR-43 34

Manchurian (Fengtian) Army **B3** (16), 19, 22, 23

Natal Railways **6**, 6–7
Nechayev, Gen. Lt. K. P. 19
NKPS (People's Commisariat of Communications) 31
NKVD (People's Commisariat for Internal Affairs) armored trains 30–31, **34**, **F1** (36)

Obukhov Works 10

Petersburg, siege of (1864) **6**
Philadelphia, Wilmington & Baltimore Railroad 5
pillbox, Gruson armored **11**
Poland, German attack on (1939) 24, 26
Polish armored trains 20–21, 26–27, **G1** (40), 44; *Piłsudczyk* **18**, 20–21, **G1** (40); PP 13 *Gen. Sosnkowski* **27**; PZ 10: **26**; tank cars **23**
Polish Army **4**, 20; Armored Train Battalions, 1st, 2nd & 8th 27
Polupanov, Andrey 18, 19
Przemysl 20
Putilov Works 14

rail-cruisers, German armored 13, **C** (24); *Panzerjäger-Treibwagen* **C2** (24); *Panzertriebwagen* Nr. 16: **C3** (24), **42**, 43; *Panzertriebwagen* PT 15: 43; *Steyr schweren Schienenpanzerspähzug* (S.Sp.) **C1** (24);
rail-cruisers, Italian armored, ALn-56 "Littorina Blindate" 43–44
rail-cruisers, Russian armored, *Zaamurets* 13, **B** (16), 18, 19; Armored Train No.105, Manchurian Army **B3** (16), 19; BP No.4: 18, 19; *Orlik* **12**, **15**, 19; *Orlik Vuz cis.* 1: **B2** (16), 19
rail-cruisers, Soviet armored **F** (36) *Krasnaya Zvezda* **F2** (36) MBV-2 31; *Stremitelniy* **31**, **F3** (36) MBV D-2 30–31, **34**, **F1** (36), 43
rail trolleys, armored 28, 30; British 44; Czech Tatra T18 26, **D1** (28); Japanese 24, **D2** (28); Polish 26, **D3** (28); Russian machine-gun 13
railcar, *automotrice* 12, **13**
railroad torpedo, Russian ZhDT-3 28
Red Army 14, 18–19; armored scout vehicles 28; armored train force 31, 34; Independent Armored Train Battalion, 14th **30**; raiding teams 15; Special Far East Army 28
Rhodesian Railways 6–7
Royal Marines 6
Royal Navy 6, 7; Naval Division 8, 10
Russian armies, White 16, 19, 22; Armed Forces of South Russia 16; Don Army 16
Russian armored trains 10–12, 14–16, 20, 44; *Bronepoyezd Khunkhuz* **A2** (8); *Gen. Annenkov* 12; *Khunkhuz* class **12**, 12, **13**, **16**, 18, 19; *Sikorski* **19**
Russian Army 10, 11–12; Railway Battalion, 3rd and 4th 11; Railway Battalion, 9th 10; Zaamurskiy Railway Brigade, 2nd 11; *see also* Red Army
Russian Civil War (1917–22) **13**, 13–16, **14**, **15**, **B1**, **B2** (16), 18–19
Russo-Japanese War (1904–05) 10
Russo-Polish War (1919–21) 20–21

Seven Days' Battle (1862) 5
Siberia, Army of: sailors in **14**; Siberian Artillery Battery, 2nd **13**
Soviet armored trains 14–16, 27–28, **30**, 30–31, **G2**, **G4** (40), 44
  1941–45 31, 34–36, **35**
  BP-43 34, **G4** (40); *Moskva* **39**
  BP *Chernomovets* 16
  BP No. 10 *Roza Luksembourg* **A3**(8)
  MBV D-2 **C2** (24)
  NKVD 30–31, **34**, **F1** (36)
  OB-3 (*Tretiy*) 34, **36**, **G2** (40)
  PVO (antiaircraft defense) 34, 35–36, **39**
  Type NKPS-1942 31, 34
  Zaibaikal Tank Train **G6** (40)
Stalingrad (formerly Tsaritsyn) **13**, 14
Steyr-Daimler-Puch **C** (24)
Sudan campaign (1885) 6

tank cars, Polish 21, **23**, 26
tank destroyer cars, *Panzerjägerwagen* **G5** (40), 42; PZ 75: **44**
tankettes, TKS 26, **D3** (28), **G1** (40)
tanks: PzKpfw 38(t) 39; Renault FT light 21, **23**, 26, **G1** (40); Somua S-35 38
Trans-Siberian Railroad 18, 19
Tsaritsyn (later Stalingrad) **13**, 14

Union Army **5**, 5, **6**

Vicksburg, siege of (1864) 5

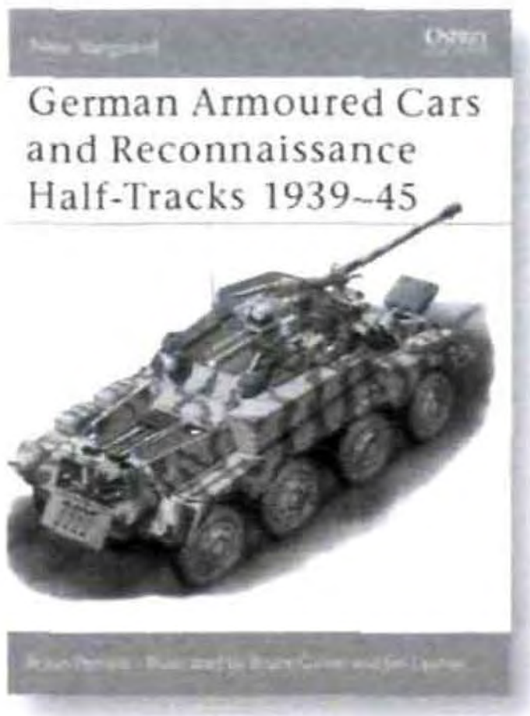
weapons, railroad 5–6
  antiaircraft guns: 37mm 34, **G4** (40); Flak 38 20mm **40**
  field guns: Mod. 02/30 76.2mm **C3** (24), **30**, **E** (31), **38**; Putilov 3-in. **13**, **B2** (16), **19**, 19; Putilov Mod. 02 76.2mm **10**, **11**; Putilov Mod. 02/26 75mm **4**; Putilov Mod. 02/30 76.2mm **C3** (24), **38**
  guns: Austro-Hungarian 70mm **A1** (8); German 37mm **23**; German 76.2mm **42**; German I.F.H. 14/19(p) 100mm **39**, **40**; Hotchkiss 6pdr **45**; Nordenfeldt 57mm 13; *Panzerzug-Kanon* L/30 70mm **10**; Parrot **6**; Russian 76.2mm **12**; Skoda 70mm **13**; Soviet 76mm **31**, **F3** (36)
  howitzers: Skoda Mod. 14/19 100mm **4**; Soviet 122mm **39**
  infantry gun, German IG 18 75mm **23**
  machine guns: Drilling MG151 30mm **43**; Maxim 7.62mm **4**, **12**, **30**, **E** (31); Soviet antiaircraft **G6** (40)
  mountain gun, 3-in. **A3**(8), 12
  naval gun, British 4.7-in. **8**
  pom-pom gun, Maxim **7**

Yugoslav civil war (1990s) 44

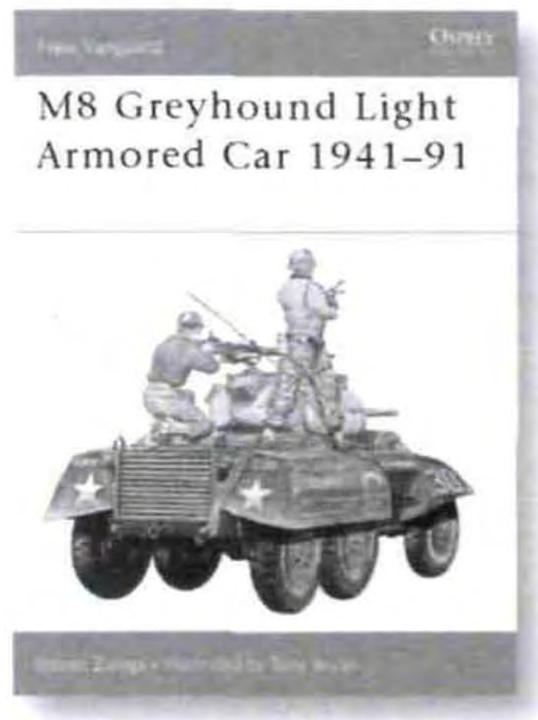
Zhang Zongchang **20**, 22
Zhang Zoulin 19, 22, 23

RELATED TITLES

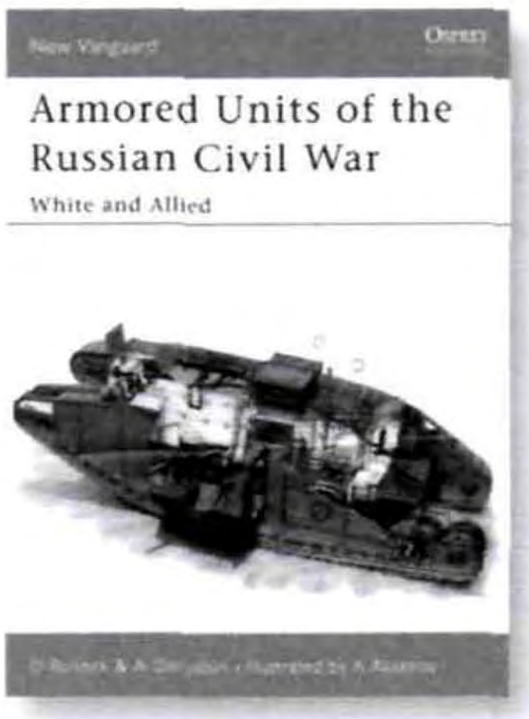
NVG 009 • *978 1 85532 382 7*



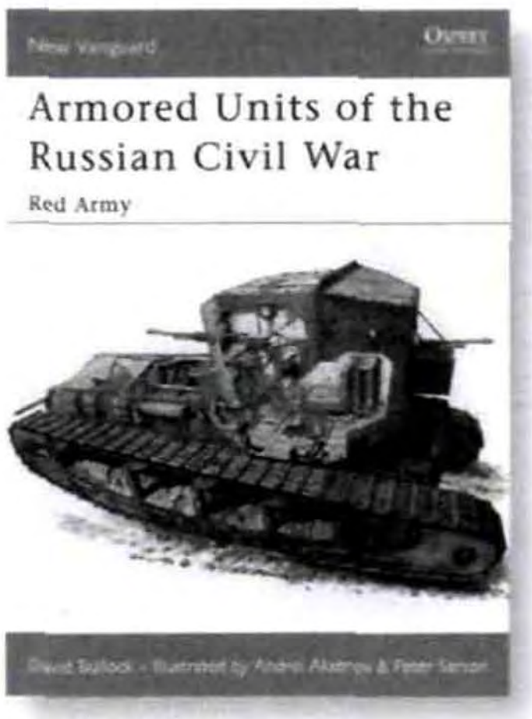
NVG 029 • *978 1 85532 849 5*



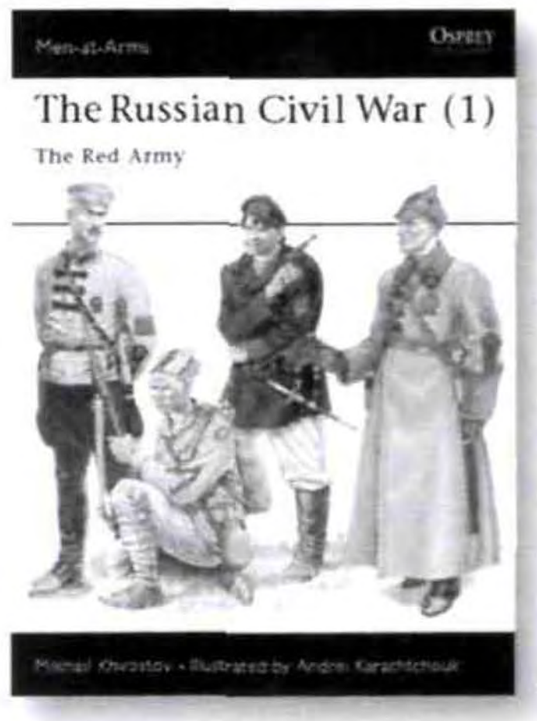
NVG 053 • *978 1 84176 468 9*



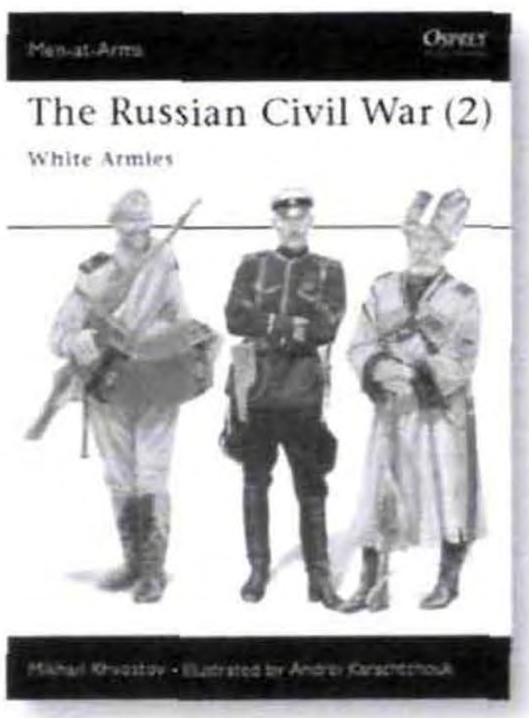
NVG 083 • 978 1 84176 544 0



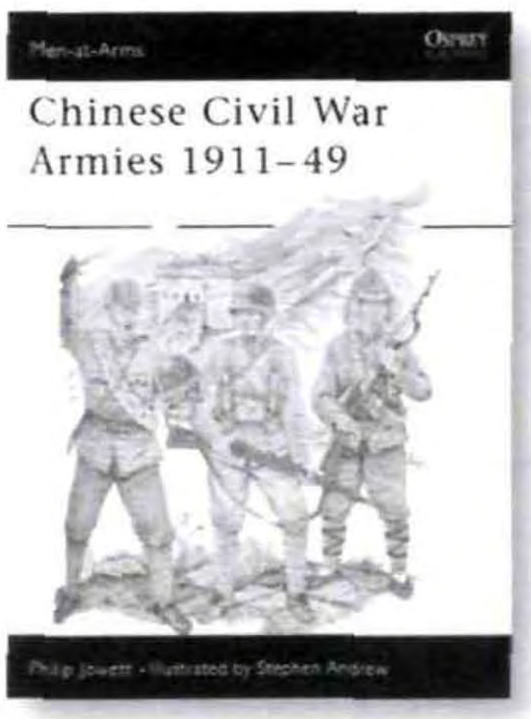
NVG 095 • 978 1 84176 545 7



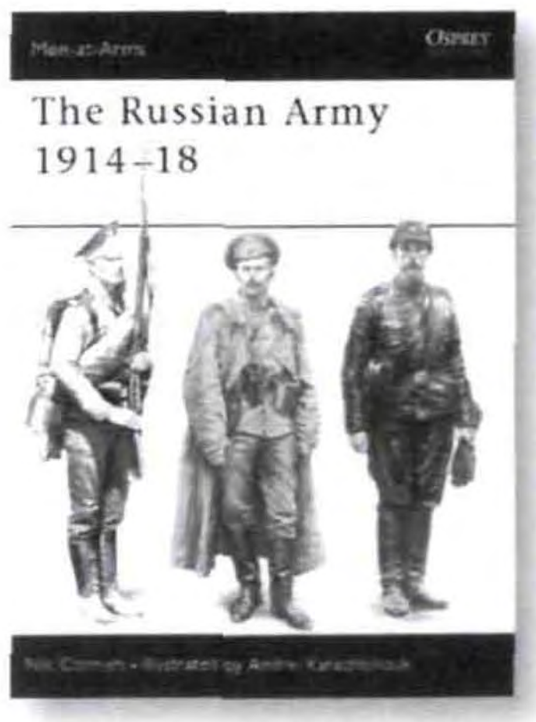
MAA 293 • 978 1 85532 608 8



MAA 305 • 978 1 85532 656 9



MAA 306 • 978 1 85532 665 1



MAA 364 • 978 1 84176 303 3

VISIT THE OSPREY WEBSITE

Information about forthcoming books ▪ Author information ▪ Read extracts and see sample pages ▪ Sign up for our free newsletters ▪ Competitions and prizes ▪ Osprey blog

www.ospreypublishing.com

To order any of these titles, or for more information on Osprey Publishing, contact:

Osprey Direct (North America) Toll free: 1-866-620-6941 Fax: 1-800-659-2436 E-mail: info@ospreydirect.com

Osprey Direct (UK) Tel: +44 (0)1933 303820 Fax: +44 (0)1933 443849 E-mail: info@ospreydirect.co.uk

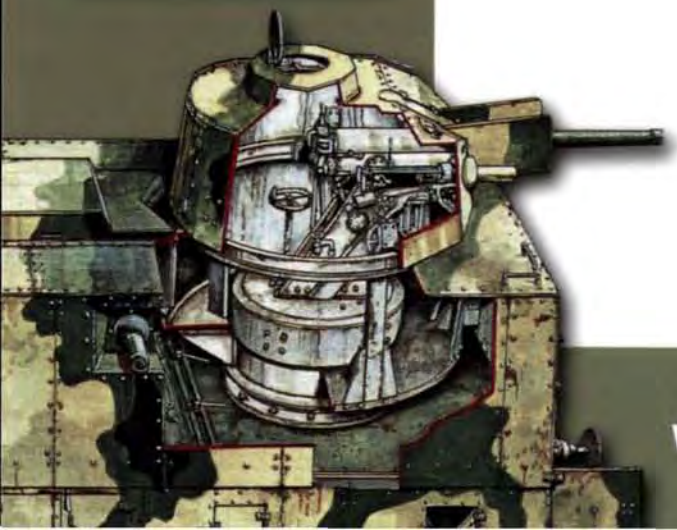
NEW VANGUARD • 140

The design, development, operation and history of the machinery of warfare through the ages

ARMORED TRAINS

First seen during the American Civil War, and later appearing in the Franco-Prussian War and the Anglo-Boer Wars, armored trains came to prominence on the Eastern Front during World War I. They were also deployed during the Russian Civil War, and the technology traveled east into the Chinese Civil War, and the subsequent conflict with Japan. They saw service on the Russian Front in World War II, but were increasingly sidelined because of their vulnerability to air attack. Steven J Zaloga examines the origins and development of the armored train, focusing equally on the technical detail and on the fascinating story of how armored trains were actually used in combat.

Full color artwork ■ Illustrations ■ Unrivaled detail ■ Cutaway artwork



OSPREY PUBLISHING

ISBN 978-1-84603-242-4

9 781846 032424

WWW.OSPREYPUBLISHING.COM